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Telephony

THE JOURNAL OF THE TELEPHONE INDUSTRY

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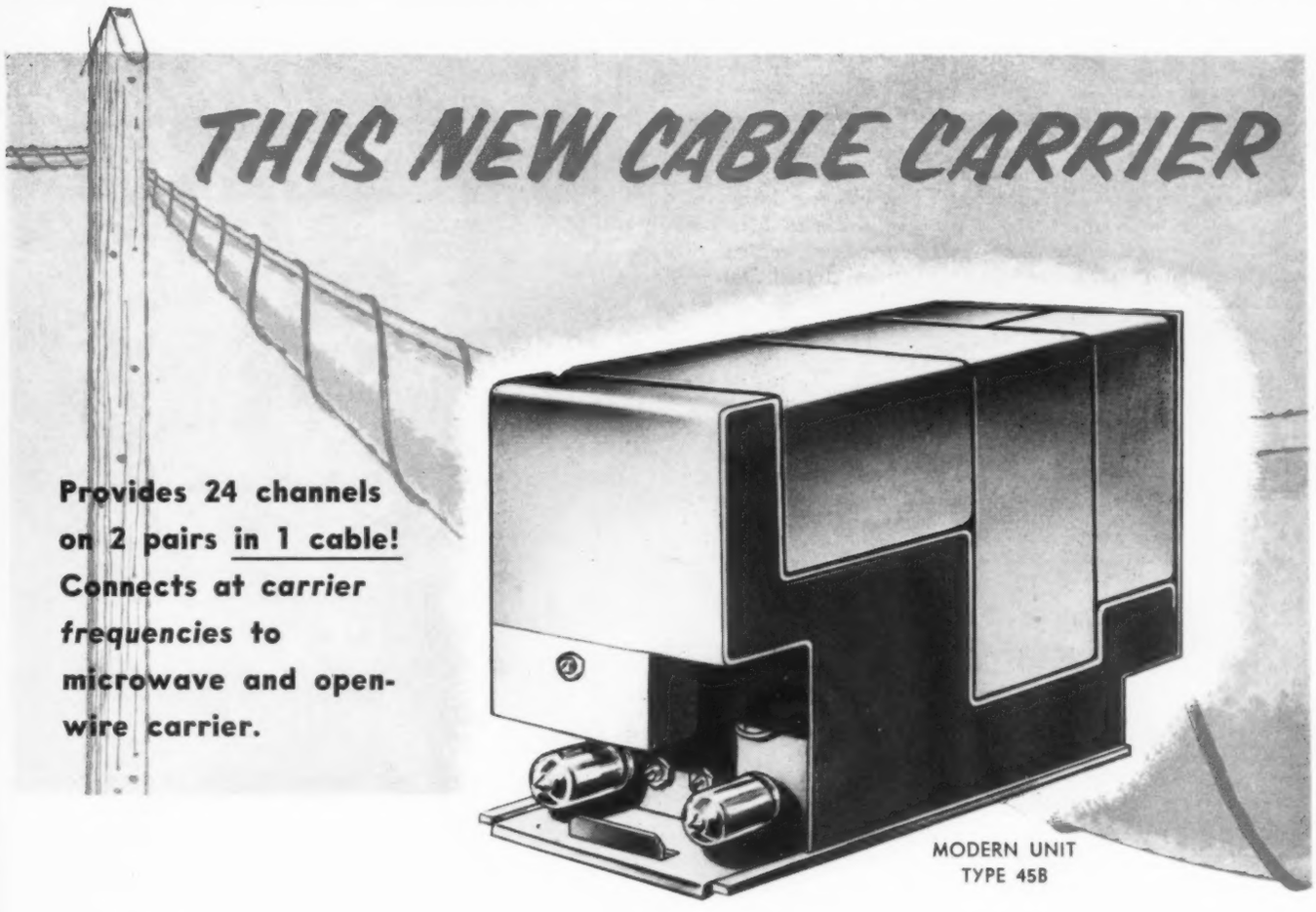

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FLASHES AND PLUGS

NATIONWIDE DIALING. A soft-hearted dog lover in Knoxville, Tenn., who wants to return a lost collie to his home, was recently very busy at the telephone. She was calling everyone named Gross in each Evansville city of the United States. There are nine.

"I know it seems like an impossible job," the lady said, "but he's such a pretty thing. I know that whoever lost him is just heartbroken—I've just got to find out who owns him."

The errant collie wandered up to the lady's home on Aug. 13 and has been there ever since. A tag on his collar read "C. H. Gross, RR3, Cook Ave., Evansville."

The woman tied the dog in her backyard and decided to find his owner.

Since then, she's discovered there are eight U. S. cities named Evansville—in Arkansas, Illinois, Indiana, Minnesota, Missouri, Pennsylvania, Wisconsin and Wyoming. And a town in Tennessee called "Evensville."

She tried to locate a C. H. Gross in all the nine cities without any luck. The Indiana town was the only one with a Cook Avenue, and no one named Gross was listed on that street. She also mailed a letter there and it came back marked "unknown."

The lady makes all the calls person-to-person, and she doesn't expect anyone but the right one to pay the bill.

Meanwhile, the dog doesn't seem very anxious to get home. He's made friends with the lady's five beagle pups and now he stays close to the house without being tied.

Despite an offer of $75 and a dozen or more claims, the lady continues her search for the real owner. The dogcatcher said she could keep the collie, but the woman says wistfully, "Of course, we've already got five dogs . . . I really don't know."

• • •

FEDERAL RESERVE. "Anything going on today?" a reporter recently telephoned a New Jersey sheriff's office.

"I don't know," a voice answered. "I'm an FBI agent trying to get out of this jail."

The agent explained that he was questioning a prisoner in one of the cells. He picked up an extension telephone and asked the reporter to call the number again and tell the sheriff he was still locked up.

• • •

LULLABY. Over a period of several weeks a San Diego, Cal., schoolboy who's been studying trumpet, stepped out on the porch of his home and played "taps" each night at 9 p.m.

He and his family were relieved that the telephone didn't jangle with protests.

Then the boy went away for a weekend.

Neighbors called to inquire if he was sick.

They had missed the taps. Some said they had lost sleep lying awake waiting for the sound.

CIRCULATION

Guaranteed circulation of this issue is 9,854, of which 9,367, or 95 per cent, is paid.

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PATH TESTING *for* Microwave Radio Routes

By R. D. CAMPBELL, Member AIEE

The equipment and procedures used for path testing for microwave radio routes are described and the methods of analyzing the results obtained in typical cases are given in some detail.

IN PLANNING the construction of a microwave radio relay system, it is important that sites for the stations be so selected that undesirable radio propagation conditions are avoided. It also is desirable to minimize the number of intermediate stations required and to utilize the smallest towers which will give satisfactory radio transmission.

While contour maps and visual sighting methods are of great assistance in selecting station sites, the maps are sometimes inaccurate; they do not indicate obstructions such as high trees and buildings, and atmospheric conditions are often not good enough for visual sighting. Furthermore, in most cases this information will not indicate clearly the possibilities of strong ground reflections which may adversely affect transmission. For these reasons, it is the usual practice in the Bell System to make propagation tests on paths proposed for backbone radio relay routes.

Theoretical Considerations

The tests usually made to check path propagation conditions consist in transmitting microwave energy between antennas at the ends of the path elevated to various heights up to 200 feet above the earth. The purpose of these tests can be understood best by considering an idealized situation such as that indicated in *Fig. 1* where *ARB* represents, in greatly exaggerated form, the surface of the earth along the desired path. For this case the earth is assumed to be perfectly smooth and to have a reflection coefficient approaching unity. With the antennas at *A* and *B* located at ground level, the direct path is obstructed by the earth and the radio energy is attenuated below the value calculated for free space transmission over the same length path.

As the antennas are raised, the attenuation caused by the earth decreases until the signal strength reaches a value equal to that corresponding to transmission in free space. Theory and tests indicate that the free space value is reached when the antenna elevations are such that the minimum clearance of the direct path above the earth is about 0.6 of the first Fresnel Zone radius as represented by line *CD* on *Fig. 1*. For antenna elevations below the line-of-sight path, only the small percentage of the energy which is diffracted beyond the horizon will reach

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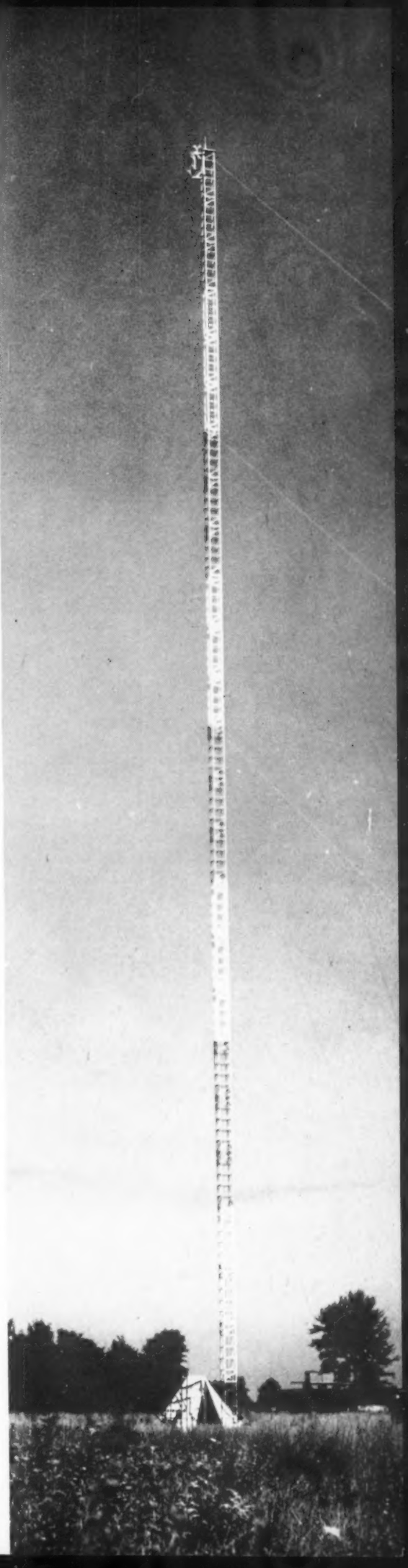
R. D. Campbell is with American Telephone and Telegraph Company, New York, N. Y.



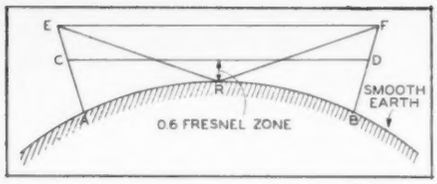


Figure 1. Diagram showing direct and reflected rays, with the vertical scale greatly exaggerated.

the receiver. For all antenna elevations above the path barely grazing the earth's surface there will be a reflected ray reaching the receiver in addition to the direct ray; under the assumption of an earth with unit reflection coefficient, the reflected and direct rays will have equal strength.

With the antennas elevated above *CD* by an amount such that the length of the path traveled by the reflected ray *ERF* is between ⅛ and ⅜ wavelength longer than the direct ray, the reflected wave will tend to reinforce the direct wave and signal strengths above calculated free space values will be observed. The maximum received signal is 6 decibels above free space and occurs at elevations such that the clearance of the direct path over the earth is equal to the radius of the first Fresnel Zone. With this clearance, the path of the reflected ray is ½ wavelength longer than the path of the direct ray and the two waves add since there is a 180-degree phase shift on reflection.

As the antennas are raised still higher the reflection path length will increase so that the reflected wave will arrive in such phase as to reduce the signal received over the direct path. When the reflected path is 1 wavelength longer than the direct path, the two signals will just cancel each other. This condition occurs when the clearance of the direct path above the earth equals the radius of the second Fresnel Zone.

As the antennas are raised still further the received signal strength again increases passing through another maximum 6 decibels above free space (clearance equal to radius of third Fresnel Zone) and falls again to zero (clearance equal to radius of fourth Fresnel Zone). This waxing and waning of the signal strength is repeated over and over as the antennas are raised, the maximum signals corresponding to clearances above earth equal to the radii of the odd-numbered Fresnel Zones and the minimum signals corresponding to clearances equal to the radii of the even-numbered Fresnel Zones.

The dashed lines on *Fig. 2* illustrate the afore-described theoretical consid-

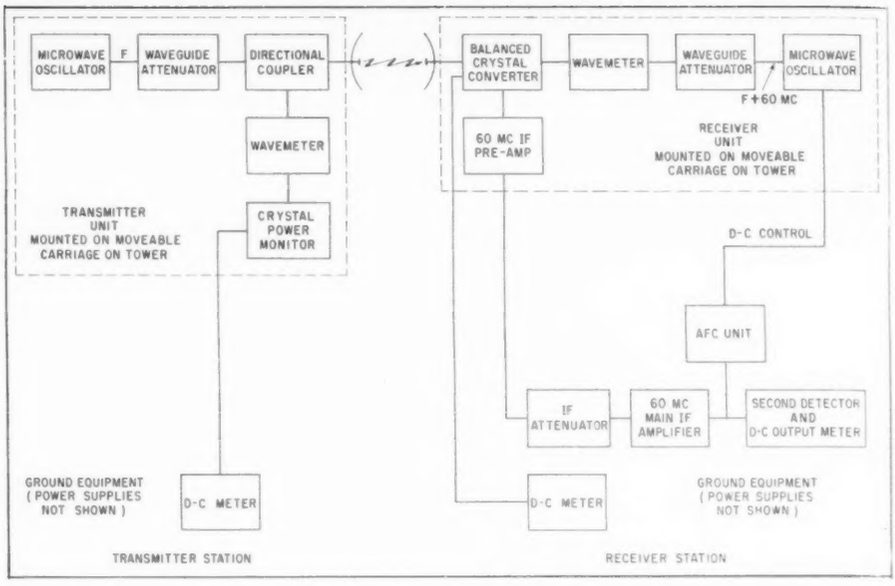


Fig. 3. Block diagram of equipment for path testing.

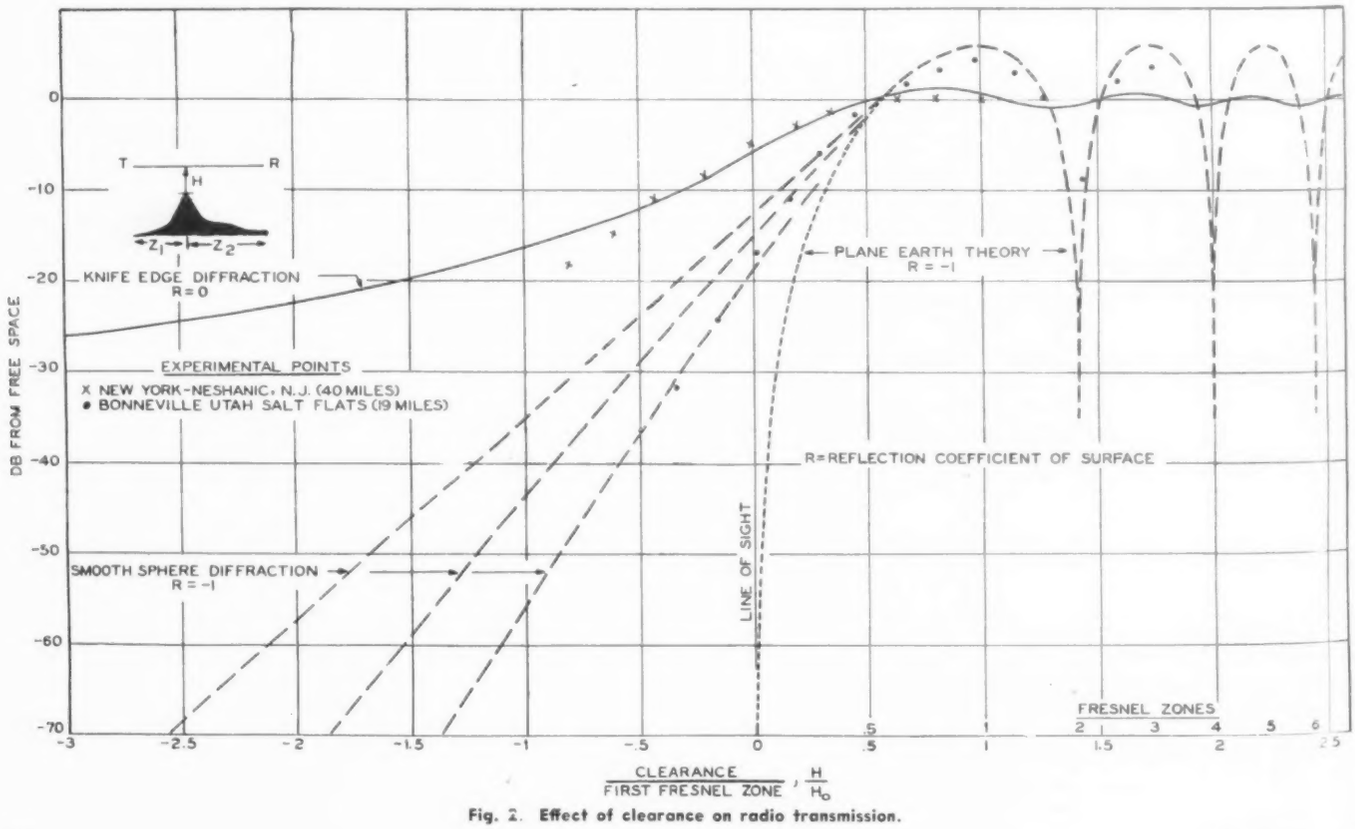


Fig. 2. Effect of clearance on radio transmission.

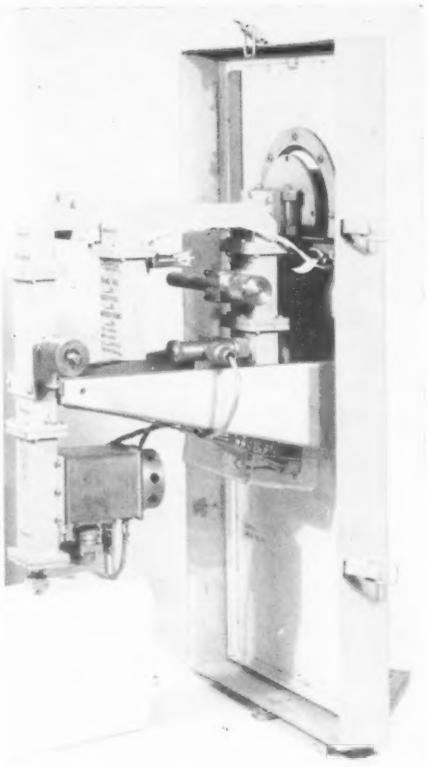


Fig. 4. Microwave transmitter for path testing.

erations and show the calculated deviation from free space transmission of signals received over smooth or plane earth as a function of the path clearance. Calculations based on a path assuming a reflection coefficient of zero and a knife-edge obstruction or discontinuity on the earth's surface such as that illustrated by the insert on *Fig. 2* show that for this case the received signal remains within a decibel or two of that for free space transmission for clearances over the obstruction greater than about 0.3 of a Fresnel Zone (see solid curve on *Fig. 2*).

As indicated by the points plotted on *Fig. 2*, actual paths having characteristics approaching the smooth earth calculations and the calculations for knife-edge obstruction have been encountered. In general, however, actual paths can be expected to have characterestics lying somewhere between the theoretical cases assumed.

Another factor which complicates the problem of selecting suitable antenna locations is the fact that propagation conditions are affected by the dielectric constant of the atmosphere which in turn is a function of atmospheric pressure, temperature, and humidity. The radio energy travels along a straight line between the transmitter and receiver when the dielectric constant is the same at all elevations. When the dielectric constant increases with height, the radio waves are refracted upward and the path clearance of the energy that reaches the receiving antenna is less than the clearance for straight-line transmission. Conversely, when the dielectric constant decreases with height, the radio waves are refracted downward and the path clearance of the energy that reaches the receiving antenna is greater than that for straight-line transmission. Both conditions are encountered in practice.

For purposes of analysis, it is often assumed that the radio energy travels in a straight line but that the earth radius changes to give increased or decreased clearance as conditions vary. This gives rise to the concept of "earth flattening" or "earth bulging." The

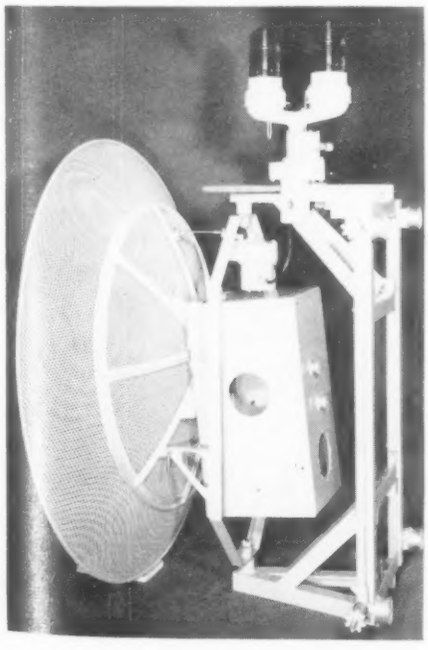


Fig. 5. Antenna carriage assembly.

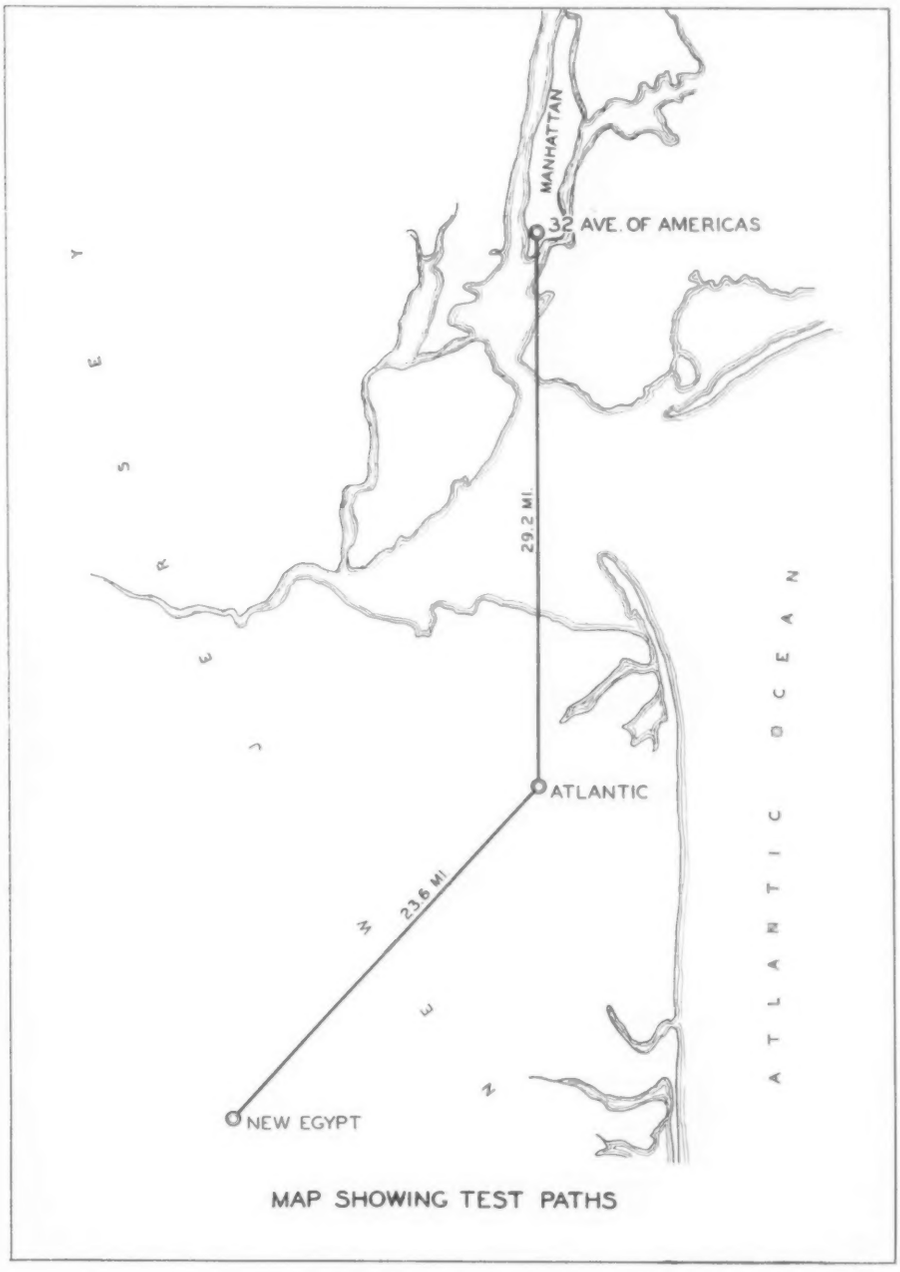


Fig. 6. Map showing test paths.

degree of "flattening" or "bulging" is frequently expressed in terms of the ratio between the effective earth radius and the actual earth radius as, for instance, an earth of 4/3 or 2/3 actual radius.

It has not been possible to determine accurately what range of effective earth radii may be encountered in a given area but estimates based on the rather meager information available indicate that the changes follow the laws of probability varying around a mean value of about 4/3 radius with extreme conditions represented by "flat earth" (infinite radius) on the one hand and 2/3 earth radius on the other hand being reached only a few per cent of the time during the worst months. Accordingly it is customary to use 4/3 earth radius as "normal" and to investigate clearances and ground reflections under the extreme conditions of flat earth and 2/3 earth.

Since the afore-described changes in the transmitting medium have the effect of causing the effective clearance on any path to increase and decrease with time, its effect on transmission over the theoretical path assumed in *Fig. 1* is to cause the characteristic curves of *Fig. 2* to shift to the right or left along the abscissa as transmitting conditions change. Care must be taken, therefore, to pick antenna heights so as to avoid, in so far as possible, operation in the nulls caused by cancellation of the direct by the reflected signals as the transmission characteristic shifts. In the majority of cases reflections occur from several surfaces and the aim is to choose such antenna heights that the nulls from the various surfaces will not coincide as conditions change. Where strong ground reflections can not be avoided, as sometimes happens on paths over water or over salt flats, it is considered good practice to select antenna elevations which fall, if possible, on a broad hump of the characteristic between nulls. Elevations providing a minimum clearance of about 0.25 first Fresnel Zone radius for the 2/3 earth radius condition to 1.7 for the flat earth condition are considered about optimum for such paths.

It will be apparent from the foregoing discussion that path tests should be made, if possible, under normal atmospheric conditions, or transmitting conditions which are likely to prevail most of the time. Such conditions generally exist during the daylight hours when the atmosphere is most likely to be stable. In any event it is undesirable to make tests during periods when strong fading is observed as this in itself would be an indication of varying propagation conditions. The prevailing conditions are checked by observations on one or more obstacles in the path whose locations are definitely known.

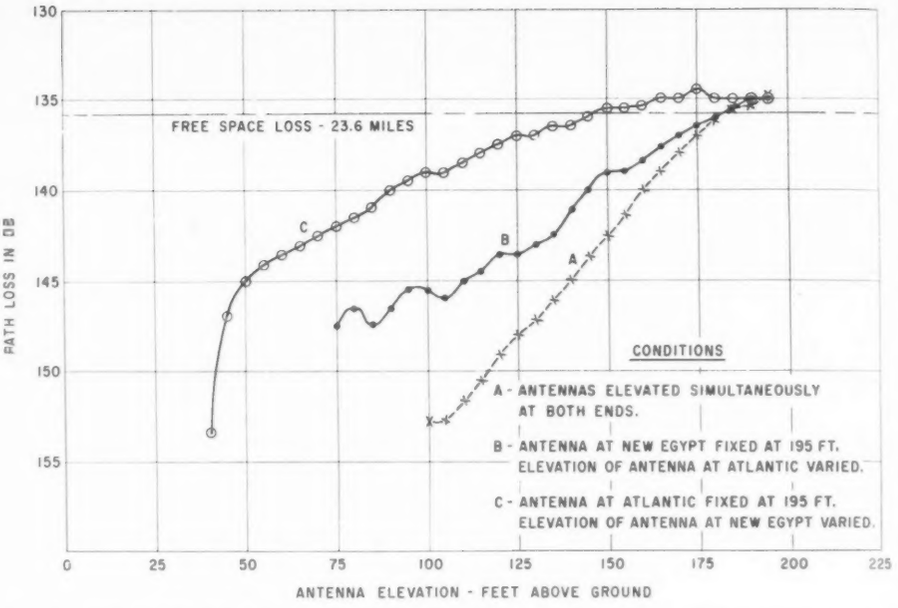


Fig. 8. Test results for Atlantic-New Egypt path, with the transmitter at New Egypt and the receiver at Atlantic.

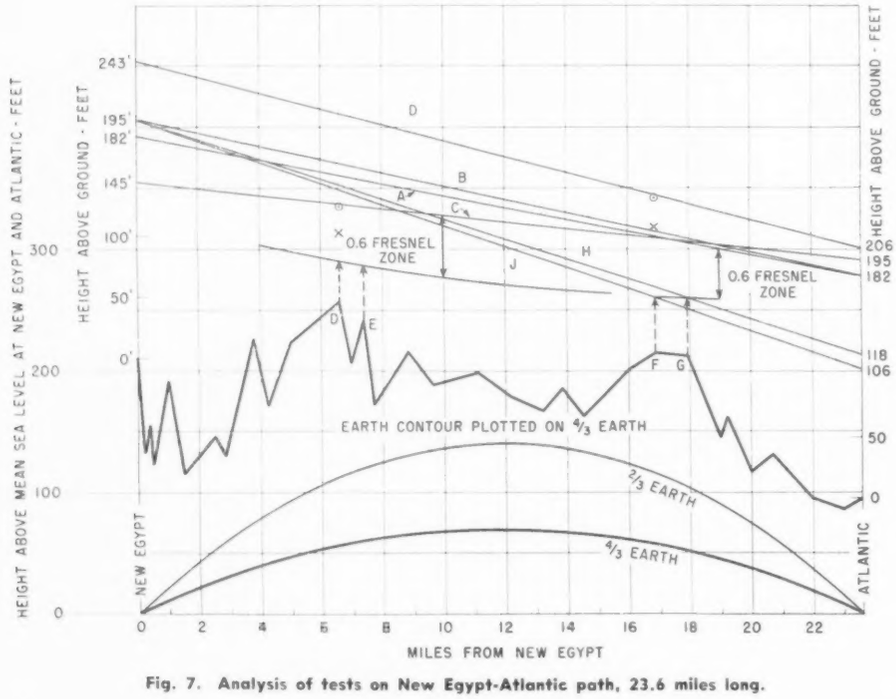


Fig. 7. Analysis of tests on New Egypt-Atlantic path, 23.6 miles long.

Equipment Arrangements

Special microwave equipment has been designed for radio path testing in the Bell System. A block diagram of this equipment is shown in *Fig. 3*. It operates on frequencies in the range 3,800-4,200 megacycles. The transmitter, *Fig. 4*, includes a reflex klystron oscillator arranged for continuous wave operation with a power output of about 200 milliwatts. The receiver consists of a crystal converter, local microwave oscillator, intermediate-frequency amplifiers, attenuator, second detector, and output meter. The radio-frequency portions of the transmitting and receiving equipments are mounted on a carriage assembly directly behind 57-inch parabolic antennas as illustrated in *Fig. 5*. The antenna carriage assembly is equipped with rollers to facilitate raising and lowering along the side legs of 200-foot portable aluminum towers used for path testing. The antenna and associated radio equipment can be oriented either in azimuth or elevation by means of remotely controlled motors. The power supply equipment, controls, measuring equipment, and, in the case of the receiving terminal, the main intermediate-frequency

(Please turn to page 30)

★ ★ ★ IN THE ★ ★ ★ NATION'S CAPITAL

by FRANCIS X. WELCH — WASHINGTON EDITOR

Bell System application for toll rate increases reverses long-time steadily downward trend. . . . FCC not likely to suspend rates. New general counsel appointed for FCC. . . . Also assistant telecommunications director for ODM. Economies effected in REA. Employe stock gains taxable?

THE DECISION of the Bell System companies to file tariffs for slight increases in overtime toll charges and night and Sunday rates on toll calls is noteworthy in more ways than one. First, it represents the first turn in a long, long road. Never before in the history of the Federal Communications Commission, which was established in 1934 by the Federal Communications Act, have toll rates ever been increased except for minor adjustments. On the contrary, the general level of the toll rates has taken a constantly downward trend as most telephone people who have been in business any time at all are well aware. Even before the FCC, the trend was down—15 reductions since 1919.

True, it isn't much of a turn. The new tariffs, to be effective Oct. 1, amount to less than 8 per cent of total interstate revenues, or about $5\frac{1}{2}$ million dollars spread over the monthly bills of the entire population of the United States. Of that amount the Bell System companies will receive less than half—about $2\frac{1}{2}$ million dollars.

The balance will be split between increased payments to Independent telephone companies and automatically increased taxes. Indeed, the Independent companies will get almost as much of the increase as the Bell companies—something in the order of 2 million dollars a month. Stated in the more usual way, on an annual basis, the new tariffs will provide 66 million dollars a year more than the 830 million dollars annual level of interstate toll revenues for the Bell System.

Readers of this department are probably well aware by this time, from prompt news reporting of this event, that the new rates would only increase overtime period rates five cents for most mileage steps above 24 miles. And increases of five cents in initial period rates for night and Sunday messages will prevail for most mileage steps between 41 and 2,300 miles. There will be a 10-cent increase in the mileage steps between 125 and 925 miles.

It seems unlikely that the FCC, which has the power to suspend these proposed rate increases for at least three months, will take such action.

One good reason that the FCC is not likely to do so is the reaction of the state commissions. The state commissions have long contended that the interstate toll business has not been bearing a fair share of the expense load as compared with the intrastate toll business.

The result has been a certain amount of pressure on the state commissions because of the fact that intrastate toll rates may be relatively higher than interstate toll rates for calls in the same mileage brackets. Therefore, state commissions are likely to welcome any reduction in the disparity between interstate and intrastate tolls.

Higher costs of furnishing service—including increased wages, material costs, and taxes—have been under review by the Bell System for some time. They are given as the main reasons for the proposed increase.

There is an interesting historical reason for the Bell System to go after increases in overtime, night, and Sunday rates—as a first step at least—rather than to increase the basic structure of the toll rate levels.

Overtime rates have not been bearing their fair share of operating costs for quite awhile, because they have drifted out of line through special circumstances going back to the war period of 1943.

Then the FCC was putting the pressure on the Bell companies to cut toll rates just at a time when emergency wartime traffic—aggravated by troop movements and defense activity generally—was placing a rapidly increasing demand on plant facilities which could not be expanded quickly enough to handle additional loads. It was no time for bargain sales in toll rates. Yet that is what would have happened if the Bell System had cut toll rates across the board, stimulating more calls.

So a compromise was worked out whereby the basic structure of the toll rates then prevailing remained the same. But the overtime period rate was reduced from one-third of the initial period rate (which generally prevailed prior to 1943) to one-fourth the initial period rate.

Obviously the mere increase of a nickel in the overtime period rate is not going to bring back the old ratio of one-third. But it will be a step in that direction. And it will be a necessary step if the overtime toll call traffic is going to bear its fair share of the operating costs.

Telephone habits of people are changing. Back in the old days of high rates for any kind of a toll call, it was not uncommon for the subscriber to sit around and prepare, plot, and edit his call long before he made it just to be sure to get finished in three minutes.

Nowadays the American public has become so used to long-distance calls, even of a casual social nature, that they go on and on just as if they were visiting on the telephone with Aunt Minnie living in the same town.

As to the night and Sunday rate increases, the objective seems to be in the direction of a 20 per cent differential. In other words, if the subscribing public gets too used to figuring that a call after day-hours or on Sunday will mean a discount of only one-fifth or less than the regular week-day rate, there will be less distortion trend toward holiday, week end, and after-hour peak loading, which has disturbed many a company's operations.

(Please turn to page 24)

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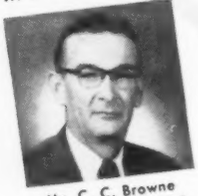

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But it will take a number of such corrective rate changes to bring about this objective. The rates filed the week of Aug. 24 are a long step toward uniform differential between regular night and Sunday rates. But the differential is still out of line in many places, particularly in shorter distances.

FCC Staff Changes

It is the FCC staff which is now studying the proposed interstate Bell toll rate increases. Speaking about the staff recalls several important changes which have been made as part of the informal overhauling which has been going on in that commission since the Republican administration came to town last January.

One most important replacement announced last week was the appointment of a new general counsel. He is Warren E. Baker, 39, succeeding Benedict P. Cottone, who resigned several months ago.

Despite his comparative youth, Mr. Baker is no stranger to commission regulatory practice. Since 1946, following wartime duty with the Navy as a communications officer, Mr. Baker has been with the Civil Aeronautics Board —the federal regulatory commission which controls the commercial air lines, just as the FCC regulates the interstate telephone companies. He was originally appointed to be a hearing examiner for the CAB, but since 1951 he has been executive assistant to CAB Chairman Oswald Ryan, Republican member of the CAB.

By way of background, Mr. Baker is a graduate *(cum laude)* of Indiana University, receiving his law degree from that school in 1940. He practiced law in Fort Wayne from 1940 to 1942, when he was called for service in the Navy. After sea duty, he put in part of his Navy tour with the Office of the General Counsel of the War Shipping Administration of the Maritime Commission—which is also a federal regulatory commission for water carriers. Mr. Baker thus brings to his regulatory duties over land communications, experience with both sea and air carriers.

During the past few months, since the resignation of former General Counsel Cottone, FCC legal affairs have been conducted by Acting General Counsel Richard A. Solomon.

Another missing face in the FCC staff line-up will be that of T. J. Slowie, who has been secretary to the commission for more than 16 years.

Telephone people who have had official business with the FCC in the past will probably recall the familiar name of "T. J. Slowie," secretary of the commission, whose duty it was to sign orders, regulations, and general communications of all kinds in the name of the commission.

Mr. Slowie's successor had not been appointed at this writing, but it probably represents another shift in the party line under the Eisenhower administration—a shift which is surprisingly slow and modest in scope, considering the fact that the Republicans have been in business in Washington now for nearly nine months. Assistant Secretary William P. Massing will fill in for Mr. Slowie until his successor is named.

It is probable that the filling of these vacancies plus further turnover in staff line-up will be speeded up after the commission itself gets its full strength membership lined up.

There is still a vacancy on the board left by the retirement of Paul A. Walker last June. As long as the vacancy has dragged along this far, President Eisenhower may wait until Congress meets for the second session before naming a successor to Walker. On the other hand it seems more likely that he will make an interim appointment which would be subject to later Senate confirmation.

One other recent Eisenhower appointment—not in the FCC but in the communications field—is that of William A. Porter, Washington, D. C., attorney, who has taken over the job of assistant ODM director for telecommunications. Mr. Porter will perform the duties formerly covered by Haradan Pratt, Federal Telephone & Radio Co., vice president, who was telecommunications advisor to former President Truman. These duties were transferred to the Office of Defense Mobilization by Executive Order.

The announcement by ODM Director Flemming said that Mr. Porter "will be responsible for co-ordinating in the executive branch of the government the development of telecommunications policies, as well as telecommunications plans and programs, designed to assure maximum security to the United States in time of national emergency. He also will co-ordinate the assignment of radio frequencies to government agencies."

One of the policy matters which Mr. Porter will sit in on is the extent to which the federal government should construct, own, or operate radio, telephone, and other facilities in foreign countries or near international boundaries for propaganda or espionage purposes. Porter's appointment became effective Sept. 8.

REA Developments

The Rural Electrification Administration is cutting down its personnel to effect economies in operating appropriations. REA Administrator Ancher Nelsen announced late last month that in the interest of efficiency and economy, certain REA activities are being discontinued, curtailed, or transferred to borrowers. A small reduction in force is being made at this time as a result of these actions, he said. Forty-eight employes are expected to be affected by the reduction. Of this number, 37 will be separated and 11 will be reassigned to lower grade positions.

One of the problems which the new REA administrator is facing is the possibility of slow payments on loans. This is something new in the history of REA, which has always been able to brag about the REA borrowers paying 100 per cent on time, and in many cases being paid up far ahead of time.

There are two explanations for the previous rosy-hued credit picture on REA loans, one of which may not be so rosy as time goes on.

First, there is the increasing amount of REA indebtedness becoming due. The heavy payments under the big bulging REA loans are just beginning to bite deeply into the REA co-ops' revenues.

The other factor which made REA repayment record look so good during the Roosevelt-Truman era was the policy of keeping the REA co-ops in debt through encouragement to make new loans to expand plants, improve lines, etc.

Thus, under the old regime an REA co-op which might be facing eventual difficulty of paying up its old loan would be encouraged to go for a bigger one and to consolidate the obligation on a bigger operating plant basis. It is not polite to make the comparison, but in private industry such financial operations are likely to lead to difficulty with the law under adverse circumstances.

Anyway, the new atmosphere at REA is one of economy, pay-as-you-go, and making collections on time. So, for the first time, we are beginning to hear advice from REA to the cooperatives to "get out and push" electric power sales if they are to stay out of the red in the next three years.

In fact, earlier this summer *The New York Times* (July 12) ran a disturbing little item about REA concern over the "financial condition of many cooperatives faced with mounting debt payments." It quotes one REA official as urging cooperatives to go all out on promotion of sales to meet their obligations.

(Please turn to page 34)

THE PLANT MAN'S Notebook

by Ray Blain, Technical Editor

AT THE RISK of being dubbed an "old crank" this writer is forced to take issue with some of the ideas covering the instruction of present-day practicing plant men.

While a knowledge of theory such as Ohm's law, ac and dc circuit operation, etc., is certainly worthwhile, we seriously doubt that valuable training time should be consumed for this purpose by a man who is currently earning his living as a practical telephone worker. In our humble opinion, these men will be able to make more progress in the telephone field if properly instructed by the "learn by doing" method.

In this connection, we particularly like the plan presently being used by the Southwestern Bell Telephone Co. at its technical training center at Topeka, Kan. Here telephone plant men from throughout Kansas learn to do things by actually doing them in classrooms which reproduce exact conditions they find out on the job. A total of 31 skills is now being taught in this school and present plans provide for adding nine more this year.

Telephone poles, complete with lines and cross-arms, are set up in one of the classrooms. Sections of five types of houses, each with a different kind of siding, have been built in one of the training center's rooms. When a new installer is taught how to string a drop wire from the pole to the house, he is not only *told* how, but *shown* how. He is allowed to do it right there.

The center also contains switchboards and dial equipment, which reproduce actual central office conditions. There are teletypewriters, mobile telephone units and carrier facilities.

The policy of this school is to have good instructors—experienced telephone men who know every detail of the job they are going to teach. Instructors are generally foremen who take the teaching assignments for about six months.

It is stated that the students soon realize the instructor knows his job, and that he is teaching them right. This gives them confidence.

When the students complete an installer course, for instance, they know the fundamentals of installing telephones correctly, and they know that they know these things.

This class training lasts from two to eight weeks. Then students return to their own exchanges. And while the knowledge is fresh in their minds, they do the jobs for which they were trained.

This school does not claim to turn out experts and it is understood that skill is something a man develops with practice and supervision on the job. Students are trained only in the basic fundamentals and the rest must come from experience back home. Generally, students are not referred to Bell System practices for a particular job until after they've learned how to do it.

Nor is this school designed only for newcomers. Men experienced in one line of telephone work can go there and learn another skill. The school trains both management and non-management employes. Since it began operating in January, 1952, more than 650 men have been trained.

• • •

The Palmer House in Chicago has a notice in each room as follows: "Call Engineering Department for television service @ $2.50 per day. Call Bell Captain for a radio @ $.75 per day. In an emergency, notify the Telephone Operator immediately."

Operators on big hotel PBX switchboards are really important and render both the hotel and the traveling public a most valuable service.

• • •

The present broad objective of the Bell System is to move steadily toward an ultimate goal which will enable any customer to dial his calls across the continent as easily as he now dials his neighbor across the street.

Today, 80 per cent of the local service in the Bell System is on a dial basis, and it is anticipated that within 10 years, the remainder of this job will be virtually completed.

Meanwhile, enough toll circuits have become dial-operated to permit operators to complete more than 40 per cent of the calls by dialing to the called telephones in distant cities. Some day the local and toll systems will become one integrated system.

• • •

A recent press release states that Belo Horizonte, Brazil, a city with a population of 500,000, served by a telephone system of 18,000 telephones, has no party lines. Individual lines are furnished each subscriber at about $3.00 per month. However, the city is growing at a rapid rate and the telephone company has a waiting list of 15,000 telephones.

• • •

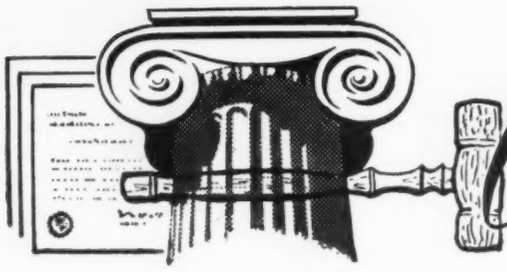
In New York City's La Guardia Airport, many of the public telephone booths are painted a bright red. This glaring red is also used on many of the booths installed in New York's subway stations.

• • •

The writer recently completed a most profitable and pleasant trip to the factories of the North Electric Manufacturing Co., in Galion, O., and the Automatic Electric Co., in Chicago. The purpose of this trip was to obtain detailed information to be used in the connection of small dial systems into a 3CL toll network.

The engineers of these two companies gave willingly and generously of their time and knowledge to furnish a solution to our numerous problems.

These visits always prove extremely helpful to the writer in keeping abreast of the latest developments in the communications industry.



Courts and Commissions

Concord (N. C.) Independent Asks $121,965 Increases

The Concord Telephone Co. asked the North Carolina Utilities Commission on Aug. 31 for permission to increase its rates $121,965 a year, stating that its present rates are inadequate to provide a reasonable return on its investment.

The company operates exchanges at Concord, Kannapolis, Mount Pleasant and China Grove.

Under the proposed increases, residence rates at Concord and Kannapolis would be set at $4.50 for one-party service, $3.75 for two-party; $2.75 for five-party, and $2.50 for rural, multi-party service. Business rates would be increased to $7.50, $6.50, $4.25 and $4.50, respectively.

China Grove business rates would be set at $5.50, $5.00 and $3.50 for one, two and five-party service, and residence rates would be $4.00, $3.25 and $2.00.

At Mount Pleasant, business rates would be $6.00, $5.50 and $3.75 and residence rates would be $4.00, $3.25 and $2.00.

Multi-party business rates at the latter two exchanges would be set at $4.00 and residence, $2.00.

The company, in asking for the increase, said it has been granted only one rate increase since 1940, and that its rates are lower than those of similar companies in the state. The last increase was on May 24, 1950, the petition says, and since then, costs of operation have steadily mounted.

The company said there also has been an increased demand for additional services and that it has issued and sold stock to provide these services.

V V

Union of Mich. to Issue First Mortgage Bonds

It was reported on Sept. 1 that Union Telephone Co. of Michigan, Owosso, received the Michigan Public Service Commission's approval to issue 1 million dollars in first mortgage bonds.

The bond issue is expected to provide basic funds for an improvement and expansion program costing $2,280,000.

The bonds will be due in 25 years and carry a 4½ per cent interest rate.

The Union company serves 72,000 subscribers throughout Michigan.

V V

N. C. Company Asks Rate Raise For One Exchange

The North Carolina Utilities Commission has authorized the Western Carolina Telephone Co., Weaverville, to increase rates at its Murphy exchange to bring them into line with rates charged at Franklin, Sylva and Bryson City (TELEPHONY, June 6, p. 32).

The Murphy property was in the process of being sold by Southern Bell Telephone & Telegraph Co. to the Western Carolina company while rates were being increased by both companies with the result that the Murphy rates remained lower than those charged by the two companies elsewhere.

V V

Sell Two Independents In Minnesota

The Minnesota Railroad & Warehouse Commission has approved the following sales of Independent companies:

On Aug. 25, the Henning-Otter Tail Telephone Co., Otter Tail, to the Perham Telephone Co.; and on Sept. 3, the Perham Telephone Co. to the East Otter Tail Telephone Co.

V V

Raise Denied Florida Company

The Florida Railroad & Public Utilities Commission on Sept. 1 denied the rate increase application of the Florida Telephone Corp., Ocala. The commission said the decision was "without prejudice, however, to the right of (the company) to renew said application when it has improved its service to the standard required by this commission and to which the public is entitled" (TELEPHONY, Feb. 28, p. 40).

V V

Ill. Company Asks Rate Raise

The Illinois Commerce Commission was to have heard on Sept. 10, the application of the Suburban Telephone Co., Dunlap, for an increase in rates.

V V

SB T&T Expected to Appeal N. C. Rate Case to State High Court

The way has been cleared for taking Southern Bell Telephone & Telegraph Co.'s North Carolina rate case to higher courts, following a ruling by Superior Court Judge William H. Bobbitt at Charlotte, that the North Carolina Utilities Commission order in the case should be revised (TELEPHONY, June 20, p. 36).

Judge Bobbitt directed that the order in the case, which was appealed both by Southern Bell and by the North Carolina attorney general, as a representative of the public, should be returned to the commission for reconsideration.

The case was regarded as a test case and attorneys for both sides said Judge Bobbitt's ruling probably will be taken to the North Carolina Supreme Court for a final decision rather than return the matter to the commission, which already had refused requests by both sides that the matter be reopened.

Southern Bell is appealing from the commission order on the grounds that the increase granted is too little, and the attorney general's office is appealing on the grounds that it is too much.

Judge Bobbitt held that the commission should not have permitted Southern Bell to include allowances for cash working capital and materials and supplies in its rate base. He said the commission should have permitted the company to earn on the present fair value of its properties rather than on original cost less depreciation.

The issues are almost identical to those raised in similar appeals from an increase allowed the Carolina Telephone & Telegraph Co., Tarboro (TELEPHONY, Aug. 22, p. 44). This case, too, is expected to be appealed to the state supreme court.

If the supreme court rules that cash working capital and allowances for materials and supplies should not be considered as company investments and included in the rate base, the amount of increase granted the two companies

might be cut. On the other hand, should it agree with the lower court that the companies are entitled to earn on the present "fair value" of their properties, the companies might be in a favorable position to ask for more.

Southern Bell asked the commission for an increase totaling $3,426,000 a year, but the commission allowed an increase of only $1,648,056.

In his decision in the case, Judge Bobbitt denied a contention of the attorney general's office that the appeal of the company from the commission's ruling had not been docketed properly and should be dismissed.

Judge Bobbitt held that the commission should:

(1) Determine the company's needs after considering all "relevant facts" as to the "present fair value" of Southern Bell's properties used in intrastate service in North Carolina. He said the commission's action in considering only the original cost less depreciation was only one factor to be considered in the matter.

(2) Exclude as factors for consideration $759,079 in cash working capital and $161,517 allowed for materials and supplies "except such amounts, if any, as the company shall identify and establish as investment funds as distinguished from tax accrual funds made available by its customers." When money paid by subscribers for future payment of company taxes is used for company purposes, the company, he said, should not be permitted to earn a return on money it actually has not spent.

(3) Allow depreciation in such an amount "as in its judgment" will be sufficient to restore at present costs properties consumed in current operations.

(4) Establish rates which "in its judgment" will produce net operating income approximating the amount needed to provide what the commission considers a fair return.

V V

Grant Oregon Company Raise To Return 6 Per Cent

The Independent Telephone Co., Pilot Rock, on Aug. 31 was authorized by the Oregon Public Utilities Commissioner to raise rates to produce an approximate additional $4,800 annually. The new schedule of rates would result in a rate of return of approximately 6 per cent.

The company had asked increases totaling $7,266.

New rates are as follows:

One-party business	$6.25
Two-party business	5.25
One-party residence	4.50
Multi-party residence	
(Airline miles from central office)	
Zero to 5-miles	4.25
Beyond 5-mile zone	5.00

Holds Better Yardstick Needed for Excise Taxes

Unless a special session is called this autumn, Congress will not be convened as a group during the coming weeks. However, many committees will be hard at work in preparing legislative proposals to be presented when Congress reconvenes in January.

Among the major bills to be discussed by committees will be new tax legislation. The House Ways and Means Committee has scheduled hearings on excise taxes, the continuance of which has occupied Capitol Hill in recent weeks.

Considerable attention will be given by the committee to telephone excise taxes, which rank high among the so-called "wartime" measures which never have been repealed. Illinois Bell Telephone Co. collects from its customers and turns over to the government more than a million dollars a week in excise taxes.

Despite this substantial tax bite, many telephone users are not aware of the rate, and sometimes of the existence, of this form of tax. There is a 15-per-cent tax on local telephone service and on toll calls under 25 cents. Long distance calls costing more than 25 cents are taxed 25 per cent.

What does this mean to the customer whose local telephone service costs $4.00 a month, and who makes $4.00 worth of long distance calls in a month? The tax on his telephone is 60 cents (15 per cent of $4.00), and he would pay $1.00 tax on the long distance calls. Thus, of a $9.60 bill, he would be paying $1.60 in federal taxes.

The average federal tax for each Illinois Bell customer is $1.55 a month, assuming that the subscriber has no extensions or other special equipment. The company will pay an estimated $52,800,000 to the federal revenue collector this year.

When excise taxes were imposed, they were intended to apply to luxury services and articles. But among the items affected were baby oil and baby powder, the excise taxes on which were repealed recently. Transportation tickets and telephone service certainly are not luxuries for a majority of those who pay for them.

Another reason for the wartime telephone tax was to discourage excessive use of crowded facilities. So much progress in extending telephone service has been made, however, that this argument no longer holds.

Congress recently voted to repeal the 20-per-cent tax on movie admissions, although President Eisenhower is reported to disapprove of this action. If this measure is vetoed, it will probably be said that the entire excise-tax schedule should be reconsidered. Although it may not be possible to eliminate all excise taxes, a fairer yardstick between necessity and luxury should be applied. (Editorial)—Rockford (Ill.) ***Register Republic.***

Three Stations Added To Bell System TV Network

The Long Lines Department of the American Telephone & Telegraph Co. recently announced that network television service was made available on Aug. 29 to three television stations including WPMT, Portland, Me., KHSL-TV, Chico, Cal., and WENS, Pittsburgh, Pa.

Television programs will reach Portland through the use of a temporary radio-relay route which terminates at the city's Eastland Hotel. From there the signals will be transmitted over a video link provided by the New England Telephone & Telegraph Co. to WPMT's broadcasting studio in the Columbia Hotel.

Network programs for Chico, Cal., are beamed to KHSL-TV from Sacramento, a relay point on the transcontinental TV route, over an 87-mile microwave link constructed by The Pacific Telephone & Telegraph Co. Network programs for WENS are fed from the transcontinental route to a telephone company building in Pittsburgh and then to the station transmitter site over a video link provided by the Bell Telephone Co. of Pennsylvania.

With these additions, network service is now available to 157 stations in 105 cities.

V V

"Liberty is given by nature even to mute animals."—TACITUS.

1st Selector
2nd Selector
3rd Selector
STROWGER
AUTOMATIC
WORLD
FAMOUS
FOR
DEPENDABILITY

Easy-To-Follow Strowger Automatic gives you *Simpler Maintenance!*

If you've ever had to track down trouble in a "dial" exchange, you'll welcome the *simplicity* of Strowger Automatic!

You can actually *see* a connection go through each step of the switching process. You can check operation by merely dialing a number and watching as the proper switches zip up and around in an easy-to-follow sequence. If you detect any irregularity, there's no tracking of complicated circuits to find its source—for the relays associated with each switch are mounted directly on it. You can easily make adjustments "on the shelf," or if you prefer, you can quickly remove a switch for bench adjustment and replace it with another to make things right again!

Of course, Strowger Automatic only rarely needs attention, it's so well made. But when it does, the process is easy, for circuits are simple, and the few parts which wear after long use are easy to replace.

Strowger Automatic is the only automatic switching equipment which has been in service *long enough* to establish records of simple, low-cost maintenance which are *beyond question.* Ask the owner of a Strowger Automatic exchange to tell you frankly about maintenance. Get the facts and figures—and you'll buy Strowger Automatic!

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Path Testing for Microwave Radio

(Continued from page 20)

amplifier are at the foot of the tower and connected to the radio-frequency equipment by flexible cables.

The test towers are fabricated of round aluminum-alloy members built up in sections 8 feet long and 22 inches square. These sections are fitted together with aligning pins which make it possible to stack them one above the other, a maximum of 25 sections comprising a tower 200 feet high. A special erecting frame is provided which makes it possible to assemble the entire tower at ground level, successive sections being added at the bottom after raising the assembled portion by means of the erecting frame. Guys and winches are used to hold the tower vertical. A receiver-antenna unit being hoisted up the test tower is shown on the cover.

Calibration of the equipment is carried out by measuring the energy at the output end of the transmitter waveguide with the antenna feed horn disconnected on a portable relative power and frequency meter. This measurement is correlated with the reading of the transmitter output meter. The portable power and frequency meter is then used to check the receiver sensitivity by measurement of the power supplied from a local signal generator adjusted to the test frequency and introduced through a calibrated attenuator into the antenna end of the receiver waveguide. The power is measured with the *IF* attenuator in the receiver adjusted to give reference reading on the signal level meter. The path loss when receiving from the distant transmitter then can be determined from the calibration measurements and the *IF* attenuator setting at the receiver required for reference reading on the signal level meter, proper allowance being made for the antenna gains, losses introduced by cable connections and directional couplers in the test equipment.

The receiving and transmitting equipments for path testing weight approximately two tons each. The majority of this weight is contributed by the tower, erecting frame, anchors, guys, and winches. The equipment for either station occupies about 1,000 cubic feet and two medium-sized trucks and trailers are used to transport it. In addition, since the equipment must be operated at remote locations, portable emergency engine-driven generators must be used for power supply. Communication between the transmitting and receiving stations is usually obtained by the use of very-high-frequency portable radio sets.

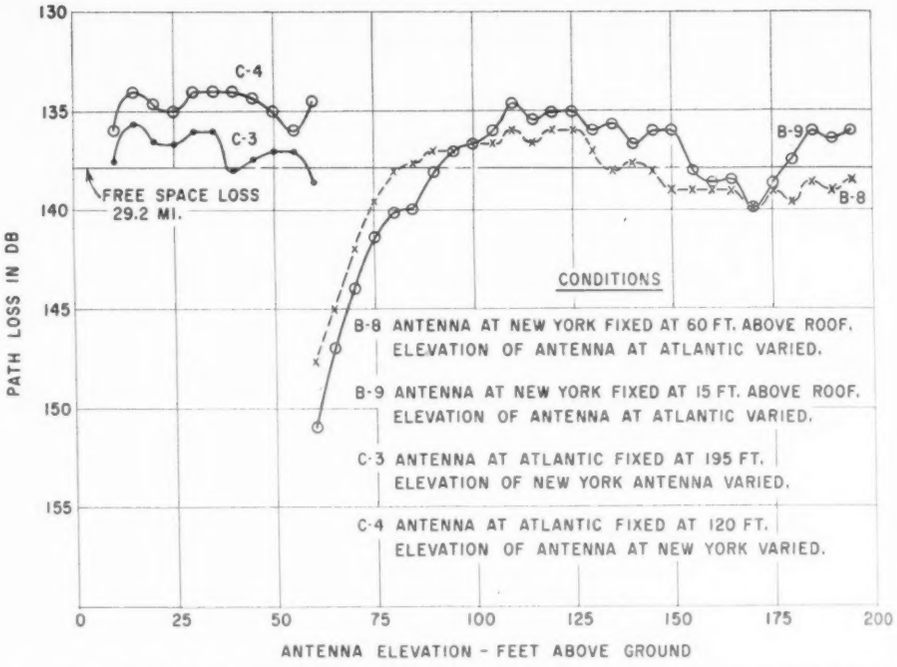

Fig. 10. Test results for New York-Atlantic path, 29.2 miles long, with the transmitter at 32 Avenue of the Americas, New York, and the receiver at Atlantic.

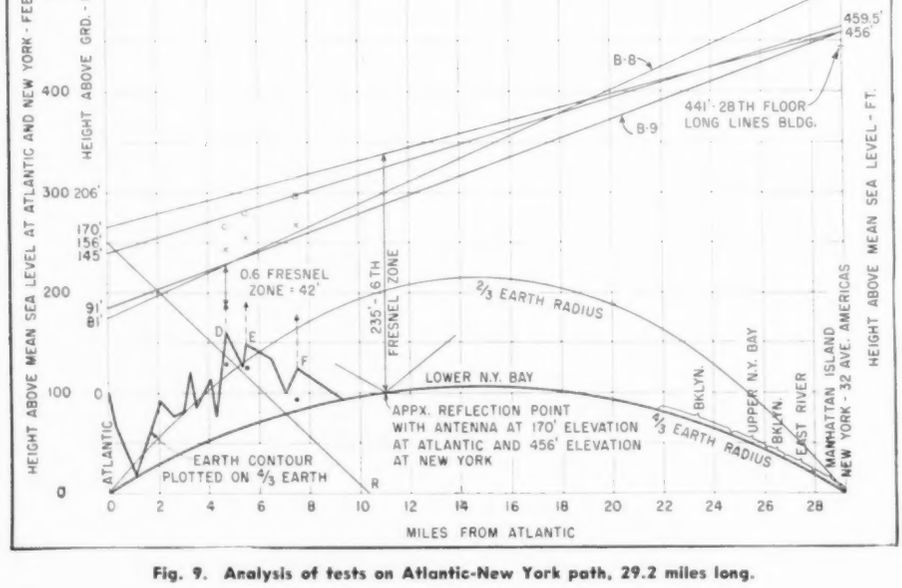

Fig. 9. Analysis of tests on Atlantic-New York path, 29.2 miles long.

Tests on Actual Paths

Two sections of the second New York-Philadelphia-Washington *TD-2* radio relay route have been selected for the purpose of describing in detail the results of path-testing measurements. *Fig. 6* is a map showing the location of the two sections under consideration, namely the section from New York American Telephone & Telegraph Co., Long Lines Bldg., 32 Avenue of the Americas) to a point near Red Bank, N. J., referred to as the Atlantic repeater station and the section from Atlantic to New Egypt, N. J., about 13 miles east of Bordentown, N. J.

Path From Atlantic to New Egypt. The Atlantic-New Egypt path, 23.6 miles long, was selected as typical of farming country with some hills, a type of terrain which is frequently encountered in the East in establishing intercity systems. A profile of the surface of the earth based on a 4/3 earth radius for this path is shown in *Fig. 7*. The ordinates show feet above mean sea level at New Egypt and Atlantic,

and the abscissas miles from New Egypt. Three series of test measurements were made over this path transmitting from New Egypt on 4,130 megacycles; and receiving at Atlantic as described below:

Test — *Description of Test*

A....Measurements of path loss with the New Egypt antenna fixed at 195 feet and the antenna at Atlantic elevated in steps of 5 feet above ground from 75 to 195 feet.

B....Measurements of path loss with the New Egypt antenna fixed at 195 feet and the antenna at Atlantic elevated in steps of 5 feet above ground from 75 to 195 feet.

C....Measurements of path loss with the Atlantic antenna fixed at 195 feet and the antenna at New Egypt elevated in steps of 5 feet above ground from 40 to 195 feet.

As indicated in the foregoing, test data were obtained for maximum elevations using 200-foot towers. This procedure is followed in practically all such tests except in the case of tests from building roofs or mountain tops where the area is too small to permit proper guying of the full tower. Data at the top of the towers frequently reveal obstructions near the center of the path which are not important when conditions are normal but which may become major obstructions under earth bulging conditions. The results of the tests on the Atlantic-New Egypt path are shown on *Fig. 8*.

The limited height of the test towers (200 feet) did not permit obtaining data for clearances on this path greater than about the first Fresnel Zone radius. However, the fact that the maximum signal strength observed was only about 1 decibel above free spaces indicates the absence of strong ground reflections on the path under normal conditions and subsequent studies did not reveal any likelihood of serious reflections under earth bulging conditions. The general slope of curves *B* and *C* in the range just below free space loss is of interest. The fact that the path loss decreases more rapidly with equal changes of antenna heights for curve *B* and for curve *C* is an indication that the controlling path obstruction for antenna elevations greater than 110 feet or so is nearer Atlantic than New Egypt (probably due to trees on hills *F* or *G*, *Fig. 7*).

From Test A, *Fig. 8*, it is determined that the transmission loss is the same as the free space loss when the antennas at both ends are elevated 182 feet above ground. A straight line *A* has been drawn on *Fig. 7* to show the center line of the transmission path with both ends at this elevation. As indicated in the discussion under the section on theoretical considerations, this indicates that the minimum path clearance with the antennas at this elevation is approximately 0.6 Fresnel Zone.

From Test B, *Fig. 8*, it is seen that the cross-over with free space transmission occurs with the receiver at Atlantic elevated 182 feet and the transmitter at New Egypt elevated 195 feet. A line *B* interconnecting these points has also been drawn on *Fig. 7*.

Finally from Test C, *Fig. 8*, it is seen that the cross-over with free space transmission occurs with the transmitter at New Egypt at 145 feet and the receiver at Atlantic at 195 feet. A straight line *C* interconnecting these points also has been plotted on *Fig. 7*.

By inspection of *Fig. 7* it appears that the minimum clearance for path *C* occurs above point *D*. By plotting the 0.6 Fresnel Zone line corresponding to path *C* it is found that its clearance over *D* is 33 feet and over *E* is 45 feet as represented by the dotted arrows. Also a portion of the 0.6 Fresnel Zone line corresponding to path *A* has been plotted and this line clears the earth at points *F* and *G* by about 45 feet (dotted arrows). Now if trees on hill *G* are the controlling obstruction the transmission path would just graze the tree tops with the New Egypt antenna at 195 feet and the Atlantic antenna at 118 feet above ground (see line *H* on *Fig. 7*). From curve *B* on *Fig. 8* it is determined that the received field with the antenna 118 feet above ground at Atlantic is only 8 decibels below free space and this appears unusually low. However, if trees on hill *F* are controlling, the graze path would occur with the antenna at Atlantic 106 feet above ground (see line *J* on *Fig. 7*). From curve *B* on *Fig. 8* the received field with the Atlantic antenna at 106 feet is found to be 10 decibels below free space which appears reasonable.

The controlling obstruction therefore appears to be trees about 45 feet tall on hill *F*. Similar analysis of the data on hills *D* and *E* indicates that there are probably no trees or other obstacles on these hills.

In order to determine the antenna heights required, it is necessary to take into account the reduced clearances which may be experienced under extreme atmospheric conditions represented by an effective 2/3 earth radius. For this purpose at 2/3 smooth earth contour has been plotted on *Fig. 7*. The separation between the contours measured along the ordinate at any point indicates the amount by which the clearance of the transmission path will be reduced when the conditions change from an effective earth radius of 4/3 to 2/3. Under the 2/3 earth condition, therefore, the tree tops at point *F* and the hill top at *D* would be pushed up from the arrow heads over these points to the points marked *x*. If tower heights were selected so that the center line of the transmission path just cleared the highest of these points the path would be just grazing under conditions of an effective earth radius of 2/3. Since the path loss at grazing clearance is seldom less than 10 or 12 decibels below free space transmission, additional clearance is usually added to reduce this loss to about 4 decibels for an effective earth radius of 2/3. In this example an additional clearance of 1/3 first Fresnel Zone radius has been added as indicated by the circles above the *x* points. A straight line passing through these circles would indicate tower heights of about 120 feet at New Egypt and 250 feet at Atlantic. However, tests of the adjacent section of route south of New Egypt indicated a requirement for an antenna elevation of 243 feet at New Egypt and in order to keep the tower at Atlantic as low as practicable it was decided to locate all the New Egypt antennas at the 243-foot level (237½-foot tower). By drawing line *D* from this point to just clear the uppermost circle in the path (over point *F*), the elevation required for the antenna at Atlantic is found to be 206 feet (200-foot tower).

Path From New York to Atlantic. The path from New York to Atlantic was selected for consideration here because of the overwater transmission involved. This path is 29.2 miles long, located as shown on *Fig. 6*. *Fig. 9* is a profile of the earth's surface on the southern portion of this path plotted in feet above mean sea level, assuming a 4/3 earth radius. The profile of the buildings on Manhattan was not prepared as tests and visual sighting observations indicate that they are probably not controlling factors on this path. Incidentally this path was selected after considerable study and testing involving various antenna locations on the Long Lines Bldg. at 32 Avenue of the Americas in New York as well as various locations in New Jersey.

For safety reasons it was necessary to limit the height of the test tower on the Long Lines Bldg. to only 64 feet and the test involving raising antennas simultaneously at both ends of the path was omitted since no significant data could be obtained from such tests with the limited antenna height at New York. Test data were obtained on this path as follows:

Test	*Description of Test*
B-8	Measurement of path loss with the transmitting antenna at New York fixed at 60 feet above the tower base and the receiver at Atlantic elevated in steps of 5 feet above ground.
B-9	Measurement of path loss with the transmitting antenna at New York fixed at 15 feet above the tower base (on 28th floor of building) and the receiver at Atlantic elevated in steps of 5 feet above ground.
C-3	Measurement of path loss with the receiving antenna at Atlantic fixed at 195 feet and the transmitting antenna at New York elevated in steps of 5 feet from 10 to 60 feet above the roof.
C-4	Measurement of path loss with the receiving antenna at Atlantic fixed at 120 feet and the transmitting antenna at New York elevated in steps of 5 feet from 10 to 60 feet above the roof.

The results of these tests are shown on *Fig. 10*. Tests B-8 and B-9 show the presence of some minor fluctuations of the received signal as the receiving antenna was elevated beyond about 80 feet, with a marked dip due to reflections at antenna elevations between 150 and 190 feet. The curves *B-8* and *B-9* on *Fig. 10* cross the line representing free space transmission at receiver elevations of 81 and 91 feet, respectively. Lines representing the center line of the transmission paths at the free space cross-over points for Tests B-8 and B-9 are drawn on *Fig. 9*.

Lines *B-8* and *B-9* of *Fig. 9* cross at about 4.8 miles north of Atlantic, indicating that the controlling obstruction is probably located on hill *D*. Six tenths of a Fresnel Zone for this location is 42 feet, at the test frequency 4,130 megacycles and by plotting this on *Fig. 9*, it is determined that the obstruction extends about 30 feet above the top of hill *D*. Visual inspection indicates that trees located on this hill constituted the controlling obstruction in the path at the time of the tests. The hills marked *E* and *F* are also of interest and the dotted arrows indicate the approximate height of trees which were found by inspection to be growing on these hills. Under earth bulging conditions corresponding to an effective earth radius of 2/3 the tree tops on hills *D*, *E*, and *F* would reach the points designated *x* with respect to the ends of this path and the circles are plotted to indicate elevations 1/3 Fresnel Zone above the trees under this condition. Likewise the elevation of the top of the trees on these hills under flat earth conditions are shown by the black dots below *D*, *E*, and *F*, respectively.

As it was desired to avoid construction of a tower on the Long Lines Bldg., the elevation of the antenna on this end of this path was fixed at 459.5 feet which is 18.5 feet above the 28th floor roof. Drawing a line from this point just above the circles over hills *D*, *E*, and *F* gives the minimum height required for the antenna at Atlantic as 145 feet above ground.

While the antenna pointing south from Atlantic was to be located 206 feet above ground, this elevation was obviously not suitable for the antenna pointing toward New York because serious reflections from the surface of Lower Bay would be experienced. In fact, reference to *Fig. 10* indicates the presence of some reflections even at the 170-foot elevation. Hence it was decided to put the antennas pointing toward New York on a platform on the Atlantic tower at the 150-foot level which makes the center line of the antenna 156 feet above ground. An antenna location at a somewhat lower elevation would be preferable, were it not for the obstructions on hills *D*, *E*, and *F* *of Fig. 9*. However, the tests plotted on *Fig. 10* indicate that the transmission loss over the path will be about equal to free space under normal conditions 4/3 earth radius) using these antenna heights. With greater earth bulging, the water reflection path will be shielded even more due to the trees on hills *D*, *E*, and *F*.

With a flat earth the distance in miles from the Atlantic repeater to the reflection point is given by the formula

$$d = \left(\frac{h_1}{h_1 + h_2}\right) D$$

where

h_1 = height of Atlantic antenna above sea level
h_2 = height of New York antenna above sea level
D = length of path in miles

From this formula, the reflection point is found to be 10.3 miles from Atlantic. A line from the antenna location to this reflection point (*R* on *Fig. 9*) passes below the black dots indicating the tree tops on hills *E* and *F* under flat earth conditions. Hence it appears that water reflection will be blocked by the trees under this condition also.

Consider again the dip corresponding to a receiver height of 170 feet in the path loss curve *B-9* of *Fig. 10*. The center line of this path has been plotted on *Fig. 9* between the 170-foot elevation at Atlantic and the 456-foot elevation at New York. Now by inspection it appears that the water reflection for this path under 4/3 earth radius conditions might take place at a point about 11 miles north of Atlantic. At

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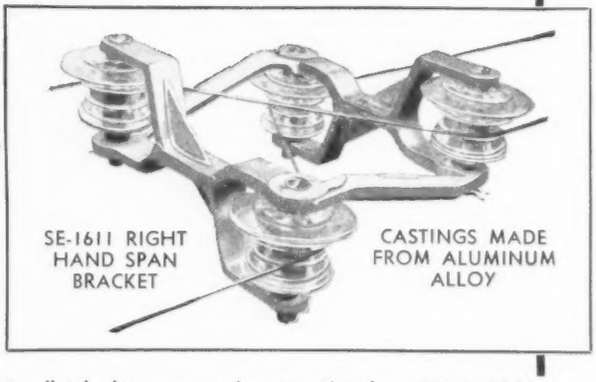

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this point the center line of the direct path is measured on *Fig. 9* as 235 feet above the 4/3 earth surface. The sixth Fresnel Zone radius for a 29.2-mile path is calculated as 230 feet at 11 miles from one end of the path. This is considered to be a fairly good check on the measured clearance of 235 feet at 11 miles and hence it is believed that the 6th Fresnel Zone is responsible for the dip in the path loss curve. This method is also used on overland paths when there are enough dips or "wiggles" in the curves to determine where the reflecting surfaces are located. It will tell the height of the ground and, in many cases, also the tree heights. For example if a nearby hill shields a mid-path bare hill or field when the antennas are lowered preventing a direct determination of the elevation, the discontinuity in the height loss curve caused by reflections from the mid-path location can sometimes be used as indicated to calculate the height of the reflection surface.

Limitations of Testing Procedure

It will be apparent from the foregoing that while microwave testing of proposed transmission paths provides information of great value to the engineer, nevertheless the testing procedure currently in use does have certain limitations. One of these is the fact that testing is normally limited for reasons of economy to relatively short periods of time and hence the results do not show the magnitude or frequency of occurrence of variations in atmospheric conditions which may affect transmission. While the tests are usually made only at times when it is believed that transmission is normal, this is not always possible and the test data must be carefully analyzed in all cases to be sure what conditions are prevailing during the tests. The procedure would be considerably simplified if some simple means of more positive determination of prevailing transmission conditions were available.

Another limitation lies in the fact that the tests are made using unmodulated continuous-wave transmissions and it is impossible by this means to distinguish between ground reflections along the desired path and reflections from obstacles which may give rise to transmission over some other path of appreciably greater length. This test limitation was recently brought to light in the establishment of an intercity television circuit into a city of moderate size. Path tests using procedures such as those described in this article indicated that transmission would be satisfactory, although subject to certain reflection effects which were believed to be due to a large body of

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water in the path. When subsequent tests were made by transmitting a television picture, however, a series of vertical black and white "bars" were observed which were found to be caused by energy overshooting the receiver to strike the face of a large building beyond, from which it was reflected to the face of another large building almost in the transmission path and from there is was reflected directly into the receiving antenna. This double reflection path had a length estimated to be some 12,000 feet greater than the direct path and resulted in a signal delay of approximately 12 microseconds with respect to the main signal. Although the level of this reflected signal was considerably below that of the signal over the direct path, it was nevertheless sufficiently strong to seriously impair transmission, particularly during periods when fading was observed on the direct path. As a result of this experience consideration is being given to the use of modified test equipment which will employ pulse or modulated wave transmissions with receiving equipment capable of measuring the amplitude and time delay of reflected signals.

Conclusions

As the result of extensive observations and tests it has been concluded that the use of testing techniques similar to those described herein are of great assistance to the engineer in selecting sites and determining optimum tower heights for microwave radio relay stations. Such tests provide information which can not at present be reliably determined by any other means and while the testing work is time consuming and involves some expense, the avoidance of serious problems which otherwise might be encountered after permanent construction is completed is believed to be more than adequate justification for use of this procedure on major radio relay routes.

In the Nation's Capital

(Continued from page 24)

Of course, these co-ops owe the money to the government. Nearly a thousand of them have been established since 1936 with REA loans mostly for rural electrification, but a few more recently for rural telephone plant.

REA Administrator Nelsen is reported planning a case-by-case study of the situation. The nearly 1,000 REA cooperatives have repayments of 58 million dollars in principal and interest due this year.

In 1956, the co-ops will have to pay back 96 million dollars. To meet this debt, co-ops are counting on increased power sales, which they have been doubling every four years since 1936.

But Nelsen's concern in the matter would seem to indicate fear that co-ops will find it increasingly difficult to meet their obligations, although they are currently ahead of schedule in repayment of their government loans.

The last available annual report on cooperative operations showed 27 per cent reporting operating deficits for the calendar year 1951. Under the previous administration, REA co-ops were encouraged to augment loans through supplemental loans. Recently the interest component has begun to mount. Furthermore, if these cooperatives were to default there is little likelihood of foreclosure for obvious political reasons.

The weekly Washington news letter *Human Events* commented as follows on this, in its issue of July 15:

"The (Times) story does not say anything about the sequel to this governmental venture into the power and light business. For the past two years Congress has been reducing the appropriations to REA. Is this agency preparing to wind up its operations? Not a bit. Bureaucrats are past masters at perpetuating their useless jobs, and this agency has done so by transferring its interest to rural telephone expansion. It has made loans to both private and cooperative telephone companies in rural areas, and is now hoping that farmers' wives will not stint their use of the family telephone, so that the government may recover something on these loans—eventually."

Are Employe Stock Gains Taxable?

For some months there has been a considerable amount of confusion over whether benefits derived by employes buying stock of a telephone company under a special purchase plan are taxable as income.

For example, the employe stock plan of Bell System companies has made it possible for their employes to purchase the stock of American Telephone & Telegraph Co. at approximately $20 below market value per share.

Is this $20 differential "income" upon which a tax must be paid? Recent rulings by the Internal Revenue Division of the Treasury Department as to federal income tax liability on this $20 differential are summarized as follows —with respect to stock issued and purchased under employe stock plans beginning February, 1950:

(1) The differential, in itself, is not taxable against the employe as "in-

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come" during his lifetime *unless he disposes of the stock.* Disposition of the stock generally means selling it. Putting the stock in joint names (such as man and wife) is not regarded as a "disposition."

(2) If the employe does dispose of the stock during his lifetime, the differential becomes taxable as income, but only the *differential,* not the entire proceeds of the sale.

(3) If the employe has not disposed of the stock before his death, the *differential* becomes taxable as estate income as of the date of his death.

(4) Starting with 1953, if the employe sells his stock during the same calendar year in which it is issued, the telephone company is required to withhold tax on the *differential,* if practical —just as it does with respect to income tax withholding.

(5) If the employe sells the stock within two years (but more than one year) after it is issued, the telephone company must file an information return (Form 1099) with the U. S. Treasury Department giving the name of the employe and the amount of the differential (unless the tax has been withheld).

V V

Wis. Companies Ask Service Transfer, Rate Raise OK

The Wisconsin Public Service Commission on Sept. 10 was to have held hearings on the following:

The application of the Cranmoor Telephone Co. for authority to discontinue operation and to transfer its subscribers to the Wisconsin Rapids exchange of the Wood County Telephone Co.

The application of the Poy Sippi Telephone Co. for authority to increase rates.

V V

J. E. Byrne, Former Secretary of Wisconsin Association, Dies

JOSEPH E. BYRNE, 68, who served the Wisconsin State Telephone Association as part-time recording secretary for 15 years, died at Madison General Hospital on Sept. 2.

Mr. Byrne attended the Brooklyn, N. Y., public schools and then studied accounting and finance at New York University for three years.

At one time he was engaged by Hollerith Tabulating Co., Washington, D. C., as a field accountant.

In 1906 he entered the employ of the New York Telephone Co. in New York City, as a plant accountant.

He became methods supervisor for the eastern group of the Bell System companies. After 12 active years in this work, and training in corporate affairs, Mr. Byrne resigned to join the Independent field.

In 1929 he was instrumental in organizing the Central Union Telephone Co. of Wisconsin, and, as vice president and treasurer, operated its 14 exchanges until they were purchased by Commonwealth Telephone Co. a year later. He spent about five months in the Commonwealth company's employ until the merger was completed.

J. E. BYRNE

At the request of several Wisconsin telephone companies and other utilities, Mr. Byrne acted as a consultant in rate cases and financial and accounting problems.

On May 6, 1937, he was named recording secretary for the Wisconsin State Telephone Association. In addition to these duties, he was active in accounting for other lines of business.

In May, 1952, Mr. Byrne was succeeded by Ray J. Riordan, who was appointed the association's full-time secretary.

V V

Rochester (N.Y.) Company Makes Management Changes

William A. Kern, executive vice president of the Rochester (N. Y.) Telephone Corp., assumed the management of the company's commercial department, and William A. Pitbladdo, traffic engineer, has been promoted to traffic superintendent, it has been announced by Donald H. Campbell, company president. Appointments were effective Aug. 31.

Mr. Kern, a native of Buffalo, graduated from Colgate University in 1927 and entered the employ of New York Telephone Co. After service in New York City and in Buffalo, he was transferred to Rochester as traffic superintendent in charge of the toll office. He began working for Rochester Telephone Corp. in May, 1935, as district traffic superintendent. He was promoted to traffic superintendent in 1944, and to

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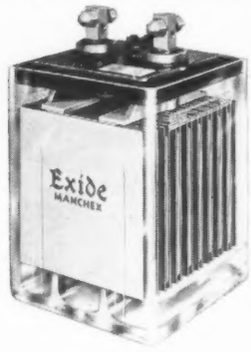

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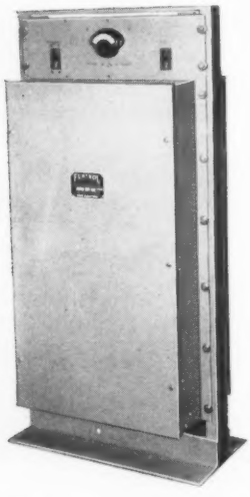

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a vice president in 1945. The commercial department, now to be managed by Mr. Kern, was formerly under the direction of J. Edward Wyckoff who has retired under the corporation's retirement plan.

Mr. Pitbladdo, a graduate of Massachusetts Institute of Technology, was employed by the Rochester company in 1934 at a central office inside man. In 1939 he was transferred to the engineering division of the traffic department. In 1944 he was appointed district traffic superintendent in the suburban area in charge of the telephone exchanges outside Rochester. He was made traffic engineer in 1946 and has been in charge of studies associated with the dial conversion program. As traffic superintendent, he will be in charge of all operations of the traffic department formerly under the supervision of Mr. Kern.

V V

BOOK REVIEW

"FUNDAMENTALS OF TELEPHONY,"

Department of the Army Technical Manual TM 11-678. Supt. of Documents, Washington 25, D. C. Price $1.25.

This new army technical manual was published in March of this year. It is apparently an educational and reference volume rather than a working handbook, but it is most complete. Its 263 parts and 240 illustrations give good coverage to the technical aspects of the telephone art.

The book covers the operating principles and basic circuits of station equipment, switchboards, dial switching, transmission lines and toll facilities. Nearly everything is presented in relatively simple language, and explanations are basic.

The first chapter, for instance, deals with sound. The subject is approached through an explanation of vibrating objects and the propagation of the vibrations through a medium. Simple experiments to demonstrate these effects are among the many illustrations. The representation of sound waves is then explained; the use of sine waves and other curves is shown. Complex wave forms from the human voice and musical instruments are illustrated. Velocity, harmonics, loudness and other characteristics of sound are explained.

It is interesting to note that the explanations of intensity are given in terms of microwatts and numerical relations, rather than in decibels.

From sound, this manual moves on to the operating principles of transmitters and receivers. Transmitter response is shown both graphically, by means of curves, and numerically, by means of a chart which shows how transmitter current varies over a period of a few milli-seconds.

Basic principles are described in terms of basic pieces of apparatus; but modern principles, such as the acoustic resistance devices found in handsets, are also covered.

About 40 pages and at least that many illustrations are devoted to substation and simple switching apparatus. Full treatment is given the operating principles of coils, condensers and other units of equipment.

The largest part of the book, about 100 pages, is given to common battery switchboards and associated apparatus. This portion covers everything from power equipment to the distributing frames. It is adequately illustrated with photos and circuit diagrams.

The chapter on transmission lines is particularly interesting because it explains how impedances are calculated, why losses occur and how loading is used. It also explains some interference conditions and suggests corrective measures. This chapter might be regarded by some as being at the transmission engineering level. It contains several formulae for various line calculations, but many of the problems are worked out in ordinary arithmetic. Explanations of the use of the decibel are included at this point.

A chapter on special circuits devotes about 10 pages to toll circuits, consisting mainly of descriptions of simplex, phantom and composite circuits.

Another 10 pages give an outline of step-by-step dial systems; coverage is scanty. No actual step circuits are given. The book itself admits that its coverage of dial has been of limited scope, but contends that "this is necessary, since a thorough understanding of the circuits, apparatus, wiring and arrangements involved in dial systems requires extended technical training."

Even so, the book is well worth the modest price asked. It could be used for classroom training or self-study.

Each chapter terminates with a summary of its contents and a series of review questions. The latter feature makes it useful in training, while the summary is a handy device for reference purposes. — **Reviewed by Harold McKay.**

V V

India, E. Africa Linked

Direct communication between India and East Africa was inaugurated on Aug. 18. At that time, the Indian minister of communication, Jagjivan Ram, at New Delhi, and President Malde of India's Chamber of Trade, at Nairobi, exchanged telephone greetings.

General of California Forms Industrial Relations Division

On Sept. 16 the duties of the newly created industrial relations department of General Telephone Co. of California, Santa Monica, will be assumed by Maurice C. Strittmatter as department director. Reorganization of the company's top management structure which commenced in July will then be completed, according to Edwin M. Blakeslee, company president.

Mr. Blakeslee added that growth of the company during postwar years required an expansion of the executive and top management organization for the distribution of responsibilities among a larger number of individuals than before.

Mr. Strittmatter went to General from St. Paul, where for the past three years he has been industrial relations manager of American Hoist & Derrick Co.

Earlier he was engaged in personnel and industrial relations work with American Steel & Wire Co. at its various plants in Illinois.

He was born in Iowa and received his elementary and high school education there. Later he received the degree of Bachelor of Science in Business Administration from Northwestern University. During World War II he was a commissioned officer in the Air Force.

Most of the duties to be assumed by Mr. Strittmatter have been carried out by Marshall Taylor who will relinquish his post as personnel manager on Sept. 16. At the board of directors June meeting Mr. Taylor was elected company secretary. In addition to the duties of that office he will continue as attorney for the company.

V V

Revolutionary Switching Device Announced by Bell Laboratories

A new electronic device which may result in revolutionary advance in telephone switching systems and in many kinds of computers has been created by Bell Telephone Laboratories, research and development organization of the Bell System, it was announced on Aug. 3.

Described as a silicon alloy junction diode, it serves as the electronic equivalent of a tiny one-way switch. Thus it acts as a rectifier. Also, it is capable of operating thousands of times faster than its mechanical counterparts.

A diode may be compared to a pipe with a check valve which allows water to flow in one direction but blocks it from flowing in the opposite direction. Switches of this type can perform as

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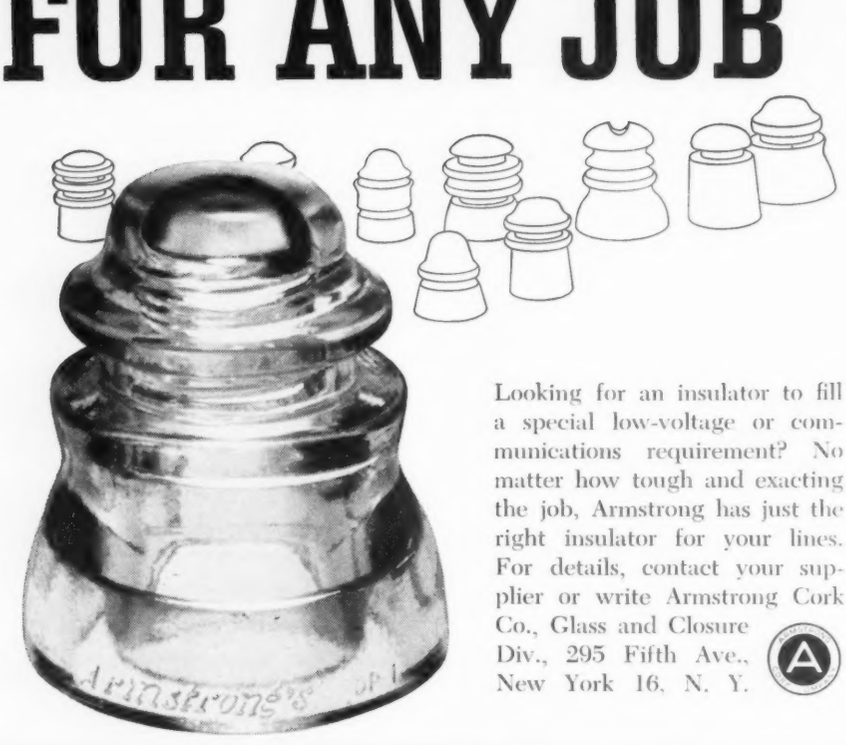

Looking for an insulator to fill a special low-voltage or communications requirement? No matter how tough and exacting the job, Armstrong has just the right insulator for your lines. For details, contact your supplier or write Armstrong Cork Co., Glass and Closure Div., 295 Fifth Ave., New York 16, N. Y.

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for communications . . . for power

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WITH
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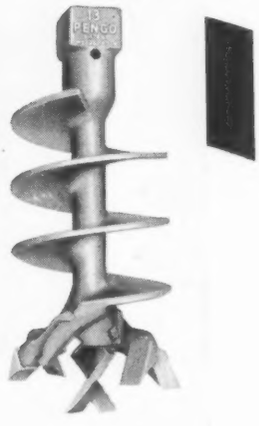

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T-9-53

PETERSEN ENGINEERING CO.
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deft fingers operating the telephone dial system—or enabling mechanical computers to make complex calculations in a fraction of a second.

The new diode contrasts sharply with a conventional two-element vacuum tube in that it requires no filament or vacuum. It has an encased element no larger than a match head, and is an accomplishment growing out of transitor research and development.

At Bell Laboratories, where the transitor was invented, silicon crystals were prepared containing controlled traces of an impurity. This reduces the normally high resistance of the mineral and enables rectification.

Under the sponsorship of the laboratories, the Du Pont company recently developed a method for the commercial manufacture of high purity silicon and has thus opened up an unlimited source of the material for electronic usage.

The new diode may also be thought of as the electronic equivalent of a dam between two bodies of water. The water can be made to flow over the dam merely by raising the level of the water on one side. However, lowering the level on this side will not result in the water flowing the other way.

Preventing an electronic back flow is never absolutely perfect so the diode is a somewhat leaky sort of dam. In the new silicon diode this back leakage is smaller than in any previous diode, about one ten-thousand-millionth of an ampere.

Compared with this, the leakage currents of vacuum tube diodes may be a thousand times greater. Another way of describing the device's performance is to say that the ratio of its resistances in the two directions is 100 million to 1.

Like the transitor, it requires no warm-up period. But unlike the present germanium transistor or diode it can operate well under high temperatures. Its lifespan should be almost unlimited.

Present plans call for the use of the new diode in the memory organ of a trannsistor-operated digital computer. In such a "brain," numbers may be remembered as charges on capacitors (or condensers). To avoid "amnesia," the charge must be prevented from leaking off.

The silicon diode is ideal for this use.

As with water over the dam, the charge is admitted through the diode to the capacitor, but the high back resistance prevents it from leaking away. Thus the combination of the diode and capacitor can store a "bit" of information.

Diodes may serve several highly im-

portant functions in the Bell System. For example, information in the form of coded numbers must be "remembered" while the call is being completed. This memory is presently provided by circuits containing relays or mechanical switches.

The production problems of the new silicon diode are being worked out with the Western Electric Co., manufacturing unit of the Bell System.

V V

BOOK REVIEW

"FIELDS AND WAVES IN MODERN RADIO" by Simon Ramo and John R. Whinnery, second edition, 575 pages. Price $8.00.

The second edition of "Fields and Waves in Modern Radio" brings up to date a work that has been in continuous use since its first appearance in 1944. The new edition is scheduled for publication in August.

The authors have retained their treatment of applied electromagnetic theory at an intermediate level of difficulty, while adding more advanced material to increase the volume's usefulness to electrical engineers and physicists. In modernizing their work, they have kept in mind the rapid development of microwave engineering so that an entirely new chapter on microwave networks has been included.

Other major changes cover new material on horns, slot antennas, paraboloids, and receiving antennas, as well as information on slow-wave guiding structures and other miscellaneous guiding systems.

More simple examples are given in the chapters on static fields; the useful Smith chart in the simple transmission treatment has been added, and several new aspects of propagating waves such as the principle of duality and slow-wave circuits have been included.

The volume's most distinctive feature is the strong use of physical pictures along with the mathematical presentation, and the stress on the practical results following from the theory.

Of special value to engineers are the treatments of the relation between low-frequency and high-frequency field concepts, and the relation between field and circuit concepts.

Simon Ramo is vice president of the Hughes Aircraft Co. and a research associate at the California Institute of Technology.

Professor of electrical engineering at the University of California in Berkeley, Dr. Whinnery was head of microwave tube research at the Hughes Aircraft Co. while on leave from the University.

The book may be purchased through TELEPHONY.

V V

"The only freedom worth possessing is that which gives enlargement to a people's energy, intellect and virtues."
—CHANNING.

Plastic Cable

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Before you choose a plastic cable, make sure you consider *General Cable's* thermoplastic. Its tough outer jacket offers resistance to sunlight, oils, and chemicals—provides excellent physical stability and long cable life. And the Polyethylene insulation on each wire assures high electrical and transmission qualities.

Thermoplastic cable is available in 19, 22, and 24 AWG —up to 404 pairs in concentric or unit construction. And it is backed by General Cable's 70 years of experience in manufacturing telephone cable. So when you think of plastic cable, think of General Cable.

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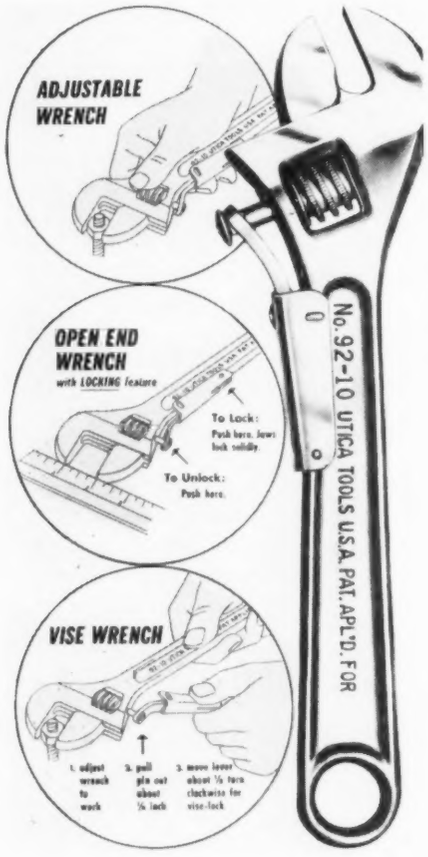
news on new PRODUCTS

LOCKING WRENCH—The Utica Drop Forge & Tool Corp. has announced a new locking wrench—No. 92. Protected by patents, it works like an ordinary adjustable wrench. However, the jaws can be locked rigid at any setting. In addition, it acts as a vise-wrench exerting a 100-pound grip on the bolt or machine component to which it is fastened.



Actually, this one wrench can fill the job of an entire kit of open-end wrenches and "double in brass" as a special vise-wrench, too, the company states.

Though it looks much like a standard Utica adjustable wrench there is one big difference—it has a lever about three inches long which snaps over the handle. This lever, which operates on the knurl, controls the jaw locking and unlocking action.

In use, the Utica No. 92 locking wrench is set to any desired opening either by adjusting the wrench lightly on the work or setting the jaws by a ruler for the correct opening. Then the lock feature can be used. A light push on the lever locks the adjustment so solidly that it can't be budged. The jaws won't spread, and even dropping the wrench or hitting it won't loosen the lock, however, a slight push on the button at the opposite end of the lever instantly releases it.

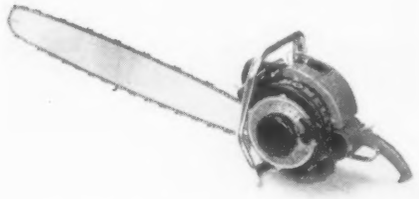
When used as a vise-wrench, the Utica No. 92 is adjusted lightly on the work like the usual wrench. Then the locking lever is moved out until the "clutch" mechanism engages the knurl.

About ¼-inch movement does this. A slight clockwise turn of the lever squeezes the jaws together vise-tight. Actually, a push with a single finger exerts 100-pounds of vise pressure. Jaws lock so tight they won't slip even on rounded nuts or bolts. When the job is finished, a reverse movement of the locking lever releases the vise-lock.

The new wrench is available in three sizes—8 inches, 10 inches and 12 inches. It is made of alloy steel with extra-hardened jaws, and the knurl is made by a new forming process which adds great strength to the locking action. Request NP 185.

• • •

CHAIN SAW—A new 30-pound, 5.5-horsepower gasoline chain saw—Model 5-30—has been announced by Homelite Corp.



The new saw cuts through a 20-inch tree in as little as 20 seconds . . . brings down timber 4 feet or 5 feet or more in diameter quickly and easily, according to the company.

Because of its light and perfectly balanced weight, the saw is extremely easy to handle; and it cuts in any position—up, down or upside down; on all types of cuts—felling, bucking, boring, notching, trimming or undercutting. In addition to its all-angle carburetion, the new saw features automatic clutch, positive chain lubrication, quick-starting, weather-proof performance and rugged and simple design.

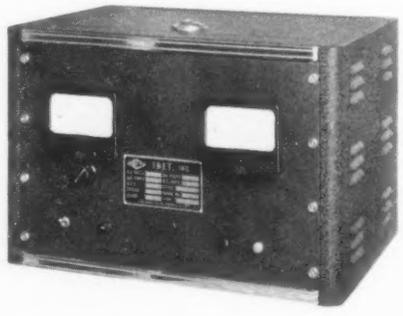
A wide range of blade sizes will be available for the new chain saw. Straight blades will be available in 18 inch, 23 inch, 30 inch, 34 inch, 42 inch and 44 inch sizes. Plunge-cut bow saws, for one or two-man operation will be available in 14-inch and 18-inch sizes. Request NP 186.

• • •

RECTIFIER—Inet, Inc., recently announced a new ac to dc regulated selenium rectifier with magnetic amplifier control. Designated MagniVolt, the company lists the following characteristics for the new rectifier:

Regulation—Better than ±1 per cent from no load to full load with ±10 per cent ac line variation.

Response—Faster than 0.2 of a second under extreme load conditions.



Ripple—Less than 1 per cent RMS (to 0.1 per cent at extra cost).

DC output ratings—1.2 to 30.0 VDC and 2.5 to 40.0 AMPS full loads.

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Chicago 5, Ill.
Please have the manufacturer send me without obligation the literature indicated by the following numbers:

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NP190 ___ : NP191 ___ : NP192 ___ : NP193 ___ : NP194 ___ :
NP195 ___ : NP196 ___ .

Name ..... Title .....

Company .....

Town and State .....
9/12/53

AC Input—115 volts, single phase, 60 cycles.

The company also claims the following features for the new rectifier:

Construction provides compactness, lightweight and minimum space requirement for mounting in standard relay racks or standard cabinets; incorporate standard ac input switch, fuse, pilot light, input and output posts; all static components eliminate expendable elements such as vacuum tubes or other moving parts providing maintenance-free, efficient operation; variations of the MagniVolt principle have been found to be applicable as a minimum cost, static regulator for rotating equipment. Request NP 187.

• • •

BOOKKEEPING MACHINE—Automatic computation and proof of net pay for each employe can be obtained in one writing for all payroll records through use of its new low-cost bookkeeping machine, Remington Rand Inc. states.

The new machine provides a complete payroll writing that includes a complete pay statement with either check or cash envelope, a complete earnings record with a chronological history of earnings and deductions for each employe, and a complete pay register in perfect agreement with other records. Request NP 188.

• • •

MICROFILM CAMERA—Remington Rand also announces a new microfilm camera—Film-A-Record Model No. 4—by which single pages, or series of pages stapled together, can be con-

veniently microfilmed without removing and then replacing the staple.

The new camera handles single sheets —even bound volumes with pages spread open, magazines, engineering notebooks and other bulky originals in all sizes up to 11 inches x 17 inches. A visual supply indicator shows at a

in any emergency!

LOWELL WIRES GET THE CALL THROUGH

The technical staff at Lowell Insulated Wire Company uses many physical tests to determine the effect of heat, aging, tensile strength, compression, cold, acids, oils, moisture and abrasion. They also employ extensive electrical tests. To create the maximum performance and dependability which is characteristic of Lowell Insulated Wire, many factors have been combined in a well balanced and efficient manufacturing process. That is why through long years in actual service Lowell Wires maintain a record for reliability and low maintenance or replacement costs. Write today for details.

DROP WIRE — neoprene jacketed, rubber insulated — between buildings and open wire telephone line.

BRIDLE WIRE — neoprene jacketed —link between drop and inside wires.

DUCT WIRE — plastic insulated — used inside buildings for connecting outside circuits to station sets.

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Neoprene Jacketed, Rubber Insulated Drop Wire, with Bronze, Copperweld or Copper conductors, Brass flashed or tinned — Neoprene Jacketed Outside Distributing Wire — Tree Wire — Plastic Insulated Inside and Duct Wire — Jumper and Distributing Frame Wire — Glazed Braided Inside Wire.

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ALPHADUCT DROP WIRE carton packaging

Once you start using Alphaduct Drop Wire you will find out that the handy carton packaging has real dollars and cents advantages.

Not only does your wire arrive in perfect condition, but the sturdy carton protects it all the while it's in your warehouse.

The cartons are easier to handle than loose coils. They can be stacked higher without danger of falling and the wire on the bottom will not be crushed or bent. Space is saved, inventory taking is simplified, and the possibility of injuries to workers from tumbling coils is removed.

We try to make Alphaduct the finest, longest lasting drop wire money can buy. Quality materials are used throughout, step-testing during every phase of manufacture assures uniform high standards. Alphaduct drop wire is dated with a color coded thread so you can tell for sure how long it lasts.

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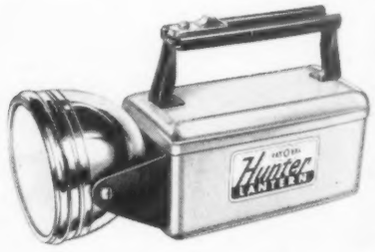
glance the amount of film left in the camera, while an audible signal warns the operator when the film has been loaded improperly, when the take-up reel is full, or when the film fails to advance properly. Simple film loading operation allows any operator without technical skill, to load or remove film, while a foot switch controls the operation of photographing the document and advancing just the correct amount of film. Colorstat permits increasing or decreasing light intensity for photographing original documents of varying color. The machine can be operated at speeds up to 1,500 exposures an hour. Request NP 189.

• • •

MEGGER INSULATION TESTER CASE—James G. Biddle Co. has introduced an improved case for the midget megger insulated tester which permits operation of the tester without removing it from the case. The leads store handily in a compartment under the instrument, which contains its own source of test current in a built-in hand generator. Request NP 190.

• • •

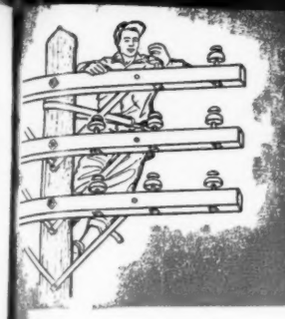
LANTERN—The Ray-O-Vac Co. has announced a new addition to its lantern line. The Hunter lantern is a one-hand lantern with the switch placed at the top of the handle. It is equipped with a flasher button for signaling. Prefocused, it has a full three-inch vacuum aluminized reflector for spot and piercing beam.



The new lantern uses eight No. 2LP Ray-O-Vac Leak Proof flashlight batteries or one No. 941 lantern battery. No bulb changing. Uses new PR 15 bulb. Request NP 191.

• • •

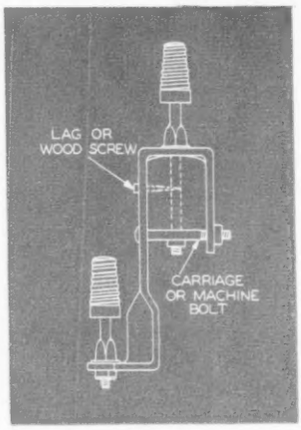
SPUR GEAR HOISTS—A total of 55 different models and sizes of spur gear

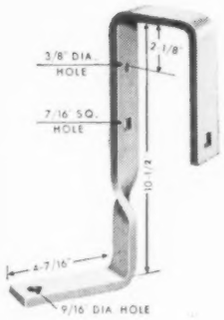


LINE CONSTRUCTION BLUEPRINTS

ITEMS SOME COMPANIES ARE USING TO MAKE
LINE CONSTRUCTION WORK EASIER

L-M Transposition Brackets

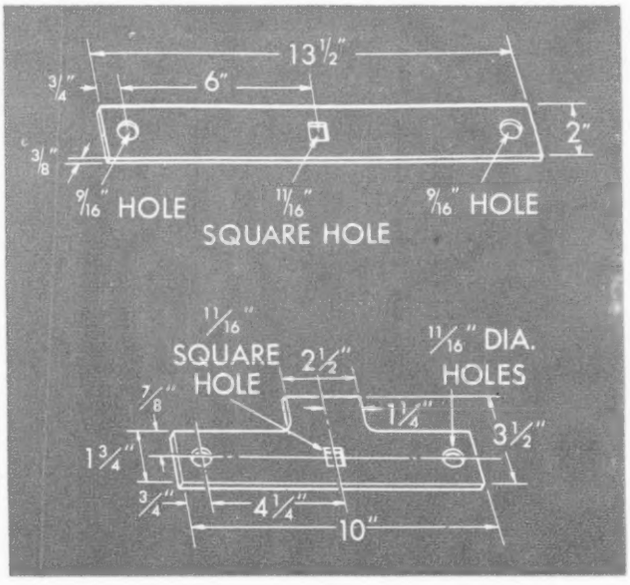


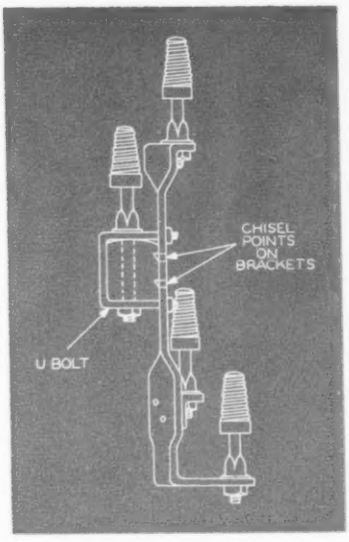


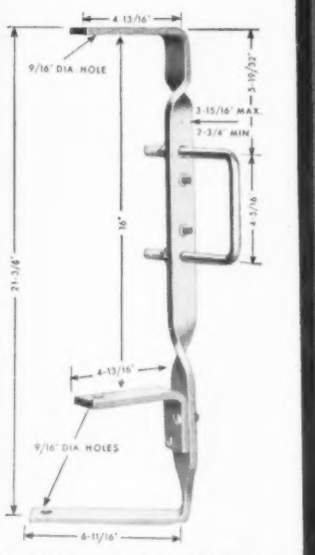
SINGLE-POINT DROP TYPE BRACKET

Cat. No. 331497X6

One-piece single-point unit for transposing two wires on a single circuit. Usually used where pull is not over 10 feet. Made of 1½" x ⅜" flat steel, hot dip galvanized.







3-POINT PHANTOM CIRCUIT BRACKET

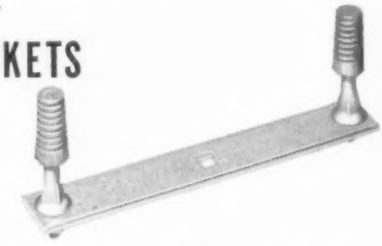
Cat. No. 330495X1

One-piece three-point bracket for phantom transpositions on separate insulators. Used where pull is not over 10 feet. Made of 1½" x ⅜" flat steel, hot dip galvanized.

TANDEM BRACKETS

TYPE B.

Cat. No. 330051A1



Of ⅜" x 2" steel, for straight sections and corners where pull is less than 15 feet.

TYPE C. Cat. No. 330071A1

Of ½"-thick steel, for angles, where the extra section gives additional support on inside of the angle. For use where pull is at least 15 feet but not over 50 feet.

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These are just a few of thousands of L-M line construction specialties. If you have a line construction problem, let us know. We may have standard or special items in stock that will solve it. Ask the North Electric or Kellogg representative, or the L-M Field Engineer. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

153

LINE MATERIAL

Line Construction Materials

Sold for L-M
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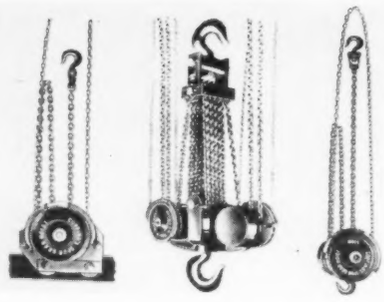
KELLOGG Switchboard and Supply Company
and
THE NORTH ELECTRIC MANUFACTURING COMPANY

hoists has been added to the Coffing Hoist Co. line, according to a recent announcement by the company.

Included among new units are 15 sizes of single and multiple-chain spur gear hoists with capacities from ¼ to 25 tons. For specialized applications, there now are plain and geared army type hoists, ¼ to 10 tons; low headroom hoists, 1½ to 24 tons; clevis-connected hoists, ¼ to 10 tons, and extended handwheel hoists from ¼ to 3 tons.

In the Army and low headroom models, the hoist is an integral part of the trolley. Trolley may be plain or geared. The advantage of this design is that it



permits hoists to work where lack of headroom prohibits the use of standard units.

Clevis-connected hoists are used where speed and efficiency of conventional Coffing spur gear hoists are desired, but where headroom prevents the standard hoist and trolley hook-up. Here, valuable headroom is gained by removing the top hook and suspending the hoist from a specially designed trolley clevis. This method of connection saves from 3 to 16 inches headroom, depending on size of the hoist used.

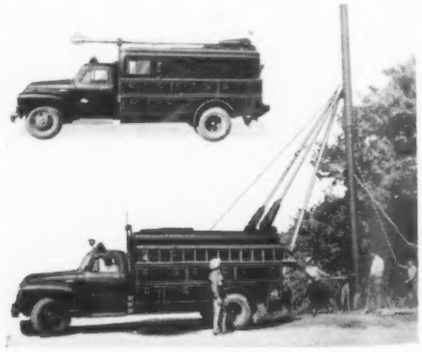
Extended handwheel hoists are desirable for handling hot materials, large, bulky loads, or where there is danger of scratching highly polished surfaces with the hand chain. On this model, the hand wheel is extended to a maximum of 10 feet, allowing the operator to stand at a distance from the load at all times.

These new Timken bearing hoists are companion units to the Coffing Models YC ball bearing hoists with capacities from ½ to 5 tons, and the lightweight, all-steel Coffing Challenger, available in ½, 1 and 2-ton capacities. Request NP 192.

• • •

TRUCK DERRICK — A truck-mounted, power-operated derrick that can be set up for work or stowed away by one man in two to three minutes is the newest product of the J. H. Holan Corp. The derrick, designated as Series 3100, is hydraulically positioned. It is designed to be permanently mounted on top of a utility body, yet leaves the working and loading space within the body clear, with ample headroom.

The side legs of the new derrick are secured in heavy swivel bearings on



top of channel sections at the rear of the body. Each has a sprocket geared to a heavy chain. The chains are driven by powerful hydraulic cylinders to swing the derrick up into working position or back into its stow position overhead. The hydraulic system is controlled by two levers conveniently located just above the rear platform on the right side of the body.

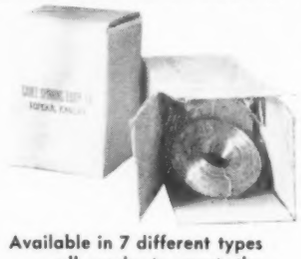
The adjustable center leg, with sheave, is permanently assembled with the side legs, requiring no dismantling when not in use. When fastened to the foot-plate on the rear platform, or

Put the "B" on Your Problems

The Neale Model B is designed for one-man operation. It may be used with equal effectiveness for spinning new cable or maintenance spinning of existing cable. This machine is easy to transfer at pole . . . simply by removing the gate in the spinner head. Many telephone companies . . . large and small . . . have reported success in using this cable spinner to reduce outside plant costs and solve problems of new construction and maintenance.

Contact Your Jobber

For Best Results Use Neale Wire



Available in 7 different types . . . all made to meet the toughest construction and corrosion problems.

THE WORLD IS SPINNING—100! PHONE 2 7234-5

Cable Spinning Equipment Co.

3100 TOPEKA AVE. TOPEKA, KANSAS

used with a special ground plate as a "stiffleg," it can be adjusted to several lengths. This can be accomplished without manual labor, as the hydraulic power raises and lowers the sections, while the operator merely inserts the locking pin.

When stowed overhead, the derrick is entirely out of the way of working space within the body. The center leg swings into a nested position against a side leg, where it is held with a locking pin. An automatic hold-down secures the assembly in its folded position at the front end of the body.

The head is so arranged that the cable may be left in it and kept slack-free with cable clips on the body, or it may be reaved through from the ground when the tripod is erected. In conventional positions the derrick handles 65-foot poles with ease.

With a special fitting, the center leg may be anchored at the front of the body, providing a boom lift for loading reels, transformers, etc. (up to 2,000 pounds) on the platform. Working capacity of the derrick is from 3,000 pounds fully extended to 7,000 pounds in the short reach position. With the third leg on the ground a 10,000 pound straight pull can be exerted. There also is an adapter arrangement available for the center leg which permits the derrick to be used with live boom effect to the full rated capacity through an arc of 70 degrees.

The hydraulic cylinders are used only to swing the derrick in or out, and do not take any of the lift load, which is transferred directly to the truck frame by the heavy channel supports. Automatic safeties protect the system against overstressing during the erecting cycle. Request NP 193.

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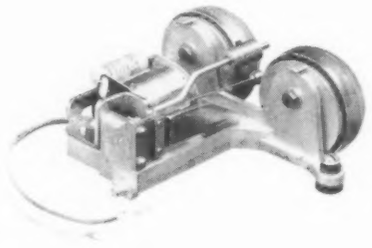
MULTI-FREQUENCY RINGERS — The new multi-frequency ringers manufactured by the United States Instrument Corp. are especially designed for use in the new Western Electric 591



telephone set. The new USI ringers make it possible to obtain the high performance of the new type 500 sets in telephone systems which use harmonic, synchromonic or decimonic ringing frequencies.

USI GB600 and GB700 ringers have

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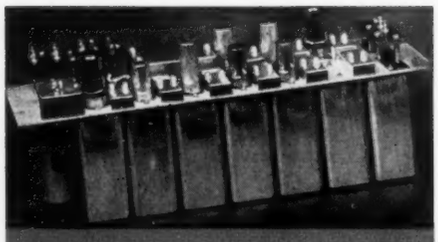


McELROY

Manufacturing Corp.

LITTLETON, MASSACHUSETTS, U.S.A.

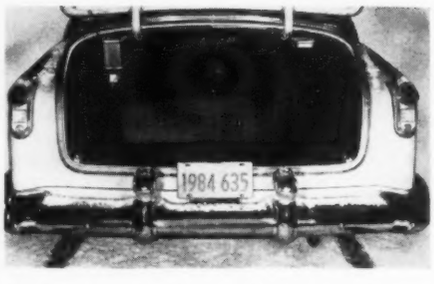
retained all the design and construction features of the new Western Electric type C ringers and have added features which make available equally superior multi-frequency ringers. The new USI ringers use a small clapper weight on a flexible arm to strike the gongs and a separate resonant weight on a solid arm to obtain resonance. This is a unique feature which contributes to the high performance, good tone quality and stability of the new USI multi-frequency ringers.

Because the ringer impedance is very high and current drawn is unusually low, it is possible to use up to 10 ringers bridged on a single line. This makes possible real savings for operating companies. USI ringers are easy to install as they are completely adjusted at the factory to ring at the designated frequency. Only a screw driver is needed to fasten the two captive screws and attach the color coded wires. Request NP 194.

• • •

SKID CONTROL FOR AUTOS—A new automobile safety device offers every motorist a weapon against skidding on icy roads—the same type of skid-control used by commercial trucks and buses for years.

The latest weapon in the fight to check the nation's traffic slaughter—38,000 killed, 1,350 injured in 1952—is a road sander called the Grip-King. It



deposits a layer of sharp, processed grit in the paths of rear wheels for instant traction and will prevent many of the accidents that until now have been unavoidable, according to the manufacturer, the Tenna-Lite Corp.

Traffic experts regard the new device as the greatest highway safety advance since the invention of four-wheel brakes and claim it will effectively reduce winter accidents—usually doubled during this period.

The new safety appliance is operated electronically by a convenient switch on the steering post. Valves concealed within the luggage compartment control a flow of grit to the rear wheels. For split-second traction to start, stop and control skidding, a driver flips the switch, the valves open, and the abrasive traction material is discharged in front of the rear wheels. Adequate grit supply can be easily maintained—an indicator light on dashboard signals the driver before replacement is needed.

The switch and luggage compartment units are easily installed, and extra bags of grit may be kept in the trunk. The non-clogging discharge tubes are hidden by the fenders.

The basic principle of the sander has been road-tested for years on truck fleets, buses and railroads. Commercial records prove almost double braking power on glare ice. Savings are reported in tire and vehicle wear, reduced gasoline consumption and fewer accidents. The Grip-King installed will cost less than a set of ordinary seat covers!

Grit used by Grip-King comes in special throw-away bags. This safety grit is especially processed and provides almost twice the traction of screened sand. Request NP 195.

• • •

TELEPHONE NOISE SUPPRESSOR—Announcement is made by Special Products Co. of a noise suppressor designed to allow satisfactory operation of any open wire telephone circuits which have become inefficient or inoperative by reason of induced toll circuit noise.

This Model "SNS" noise suppressor is an electronic device designed to change the signal to noise ratio on telephone circuits. This reduces the amount of noise heard by the listener without reducing the volume of the talker's voice to the listener.

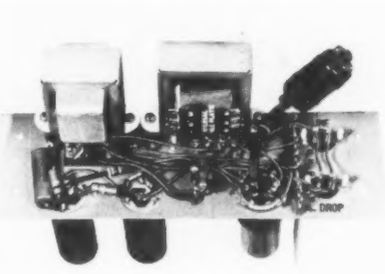
The average phantom circuit today measures about 500 noise units. This level is adjudged to be intolerable for normal "all use" circuits. The new noise suppressor is designed to bring the noise level down to less than 400 noise units and restore such circuits to normal use, the company states.

In announcing the noise suppressor, the company states:

"The satisfactory operation of phantom toll circuits has become increasingly difficult during the past 15 years because of noise induced into them from power lines. The outlook is that with present engineering practices matters will get worse instead of better.

"The noise suppressor, manufactured

by the Special Products Co., makes it possible to operate a phantom circuit satisfactorily from a noise standpoint with no more maintenance effort than was required before the rapid expansion of rural electrification. Before the widespread use of electricity on farms most power lines ran cross-country instead of following highways. There-



fore, as a rule, there was a much greater distance between power lines and telephone lines. In addition, most of the inter-city power lines of 15 years ago were balanced three-phase lines not requiring a ground return. The present day rural electrical distribution system consists, by and large, of multi-grounded neutral three-phase four-wire lines with numerous single phase taps running along the highways. The telephone lines usually parallel the power lines, running on the opposite side of the highway. This latter type of distribution system increases to a considerable extent the telephone influence factor or in other words the noise producing currents that are induced into the telephone circuits.

"Present-day telephone transposition systems for voice frequency toll circuits were designed some years ago to reduce the effect of the then existing power distribution systems on phantom circuits to where the average phantom would not exceed 125 noise units as long as the induced noise producing currents did not exceed 400 noise units. But this was 15 or more years ago. Today noise producing currents in telephone lines have increased to 2,800 noise units or more. As we still have our old style transposition systems we now find that our average phantom circuit measures about 500 noise units instead of 125 as it did some years ago. A toll circuit with more than 400 noise units is generally considered unsatisfactory for commercial message service.

"There is a simple and relatively inexpensive way to reduce the noise on a phantom circuit to a satisfactory level. This method consists of changing the relative strengths of the noise currents and the voice currents or, in other words, increasing the signal to noise ratio on the circuit.

"For example, suppose the noise measured at a toll switchboard is 1,000 noise units, enough transmission loss or resistance can be inserted between the toll circuit and the switchboard to reduce the noise to 250 noise units. But when this is done, the distant talker's voice is made very much weaker and the circuit loss becomes too great for commercial use. To overcome this difficulty a vacuum tube amplifier can be used at the talker's end of the circuit to increase the strength of the talker's voice by an amount equal to the loss caused by the resistance placed in the circuit at the listening switchboard. When this is done, we hear the talker with the same volume that we did before the resistance was inserted and we have reduced the noise from 1,000 to 250 noise units. A similar arrangement is used to reduce the noise in the other direction. Note that the amplifier amplified only the talker's voice and not the circuit noise.

"The noise suppressor, manufactured by the Special Products Co., operates on the above principle and is self-contained requiring no auxiliary equipment. Each unit, one being required at each end of the circuit, has its own power supply that operates from either 110 volt ac or dc current. The noise suppressors work equally well on either loop, simplex or composite dial circuits or ringdown circuits and require a minimum of installation effort being connected directly between the drop of the repeating coil and the toll circuit relay equipment. The suppressors are not suitable for use on toll circuits that are equipped with terminal telephone repeaters at both ends of the circuit. However, they can be used on circuits that have intermediate repeaters if proper precautions are taken with regard to transmission levels.

"These suppressors will reduce the noise on a toll circuit from 3,200 noise units to 400 noise units. As mentioned previously, the average phantom circuit of today has about 500 units of noise. Variations of individual circuits from the average run from about 280 noise units to 1,600 noise units. Use of the suppressors will reduce the noise on these circuits to between 100 and 200 noise units making very good circuits out of ones that have either been taken out of service or have been a source of repeated reports of poor transmission from subscribers. In addition to reducing the noise the suppressors will reduce the 1,000-cycle transmission loss of a toll circuit by about 3 db or produce a transmission improvement equivalent to that obtained by loading approximately three miles of 19-gauge non-loaded phantom cable." Request NP 196.

V V

D. C. Galassi Awarded High Italian Honor

D. C. Galassi, managing director of Autelco Mediterranea S.A.T.A.P., Milan, Italy, and president of International Automatic Electric Sales Co., S.P.A., Rome, was recently awarded one of the Italian government's highest honors, the "Commendatore al Merito della Repubblica."

Mr. Galassi, who is now in Milan, having recently returned after one of his frequent visits to the United States, was notified of the award in a message from Sr. Campilli, Italian Minister for Industry and Commerce, acting on behalf of the Italian Premier, de Gasperi.

The award, which actually means "Commander of the Order of Merit of the Republic," emanates from the office of the President of the Italian Republic, and is one of Italy's most valued

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Remember, it's your business to give good service. Use Koiled Kords to help keep customers satisfied, keep maintenance costs down. Koiled Kords for replacements are also available from independent telephone suppliers trimmed to fit all standard hand sets.

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D. C. GALASSI

distinctions. This recognition of Mr. Galassi acknowledges the value of his interest and efforts on behalf of the communications industry in Italy.

An officer in the Italian engineer corps in charge of the Third Army radio section during World War I, Mr. Galassi was employed by Automatic Electric Co. in 1926 after six years of association with Western Electric Co. and the Bell Telephone Laboratories. For the next two years, he guided technical and commercial activity for Automatic Electric Co. on the European continent and especially in Italy, Switzerland and Belgium.

Since 1928 he has been the executive chiefly responsible for the development of the Strowger Automatic telephone system in Italy, organizing an Italian stock company under the name of Autelco Mediterranea S.A.T.A.P. in Milan. This Automatic Electric affiliate now employs over 750 men and women and has branch offices in Turin, Rome, Naples and Genoa.

It is reported that the Italian organization directed by Mr. Galassi has benefited greatly from the technical assistance supplied by the parent organization, Automatic Electric Co., Chicago, which has enabled Autelco Mediterranea to manufacture in Italy automatic telephone exchanges and other equipment using Automatic Electric patents and techniques.

Autelco Mediterranea S.A.T.A.P. has made substantial contributions to the work carried out by the Italian government and by the telephone companies for the reconstruction and rehabilitation of communications, it is reported.

In 1952 Mr. Galassi accompanied

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His Excellency Giuseppe Spataro, Italian Minister of Posts and Telecommunications, on a visit to the United States, where the minister studied our country's communication organization and techniques. The minister and Mr. Galassi were guests of the United States Independent Telephone Association on that occasion.

V V

M. Klein & Sons Will Move To New Location

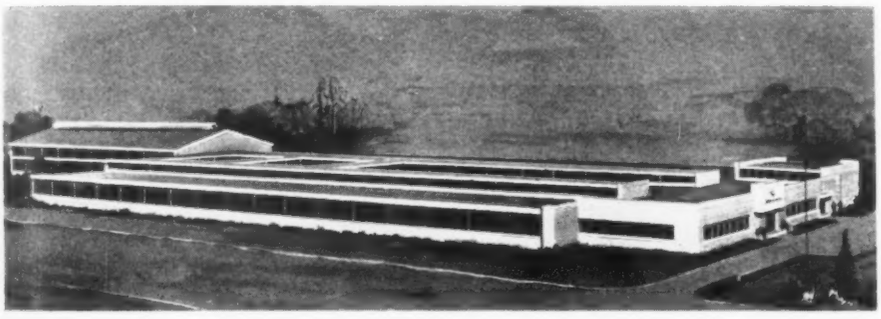
Mathias Klein & Sons, established in 1857, pioneer Chicago manufacturers of tools and equipment for the electrical industry and hardware field, are readying for a move to a new location (see cut).

Their new plant will be located in Skokie, Ill., an industrial development area north of Chicago. The modern one-story building contains 110,000 square feet permitting maximum efficiency in straight line production.

According to Mathias A. Klein, president and grandson of the founder, the new factory is scheduled for completion about June 1, 1954. The change of location is necessitated by construction of the Northwest superhighway that will absorb the present property which the company has occupied at 3200 Belmont Ave., Chicago, since 1912.

V V

"There are two freedoms—the false, where a man is free to do what he likes: the true, where a man is free to do what he ought."—CHARLES KINGSLEY.



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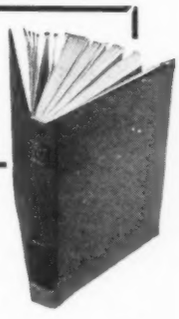

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